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North Carolina Department of Transportation
Statewide Planning Branch
Small Urban Planning Unit

Cleveland County Thoroughfare Plan

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Cleveland County Thoroughfare Plan

Prepared by the:

Statewide Planning Branch
Division of Highways
North Carolina Department of Transportation

In Cooperation with:

Cleveland County
The Federal Highway Administration
U. S. Department of Transportation

May 1997



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Acknowledgments

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Executive Summary

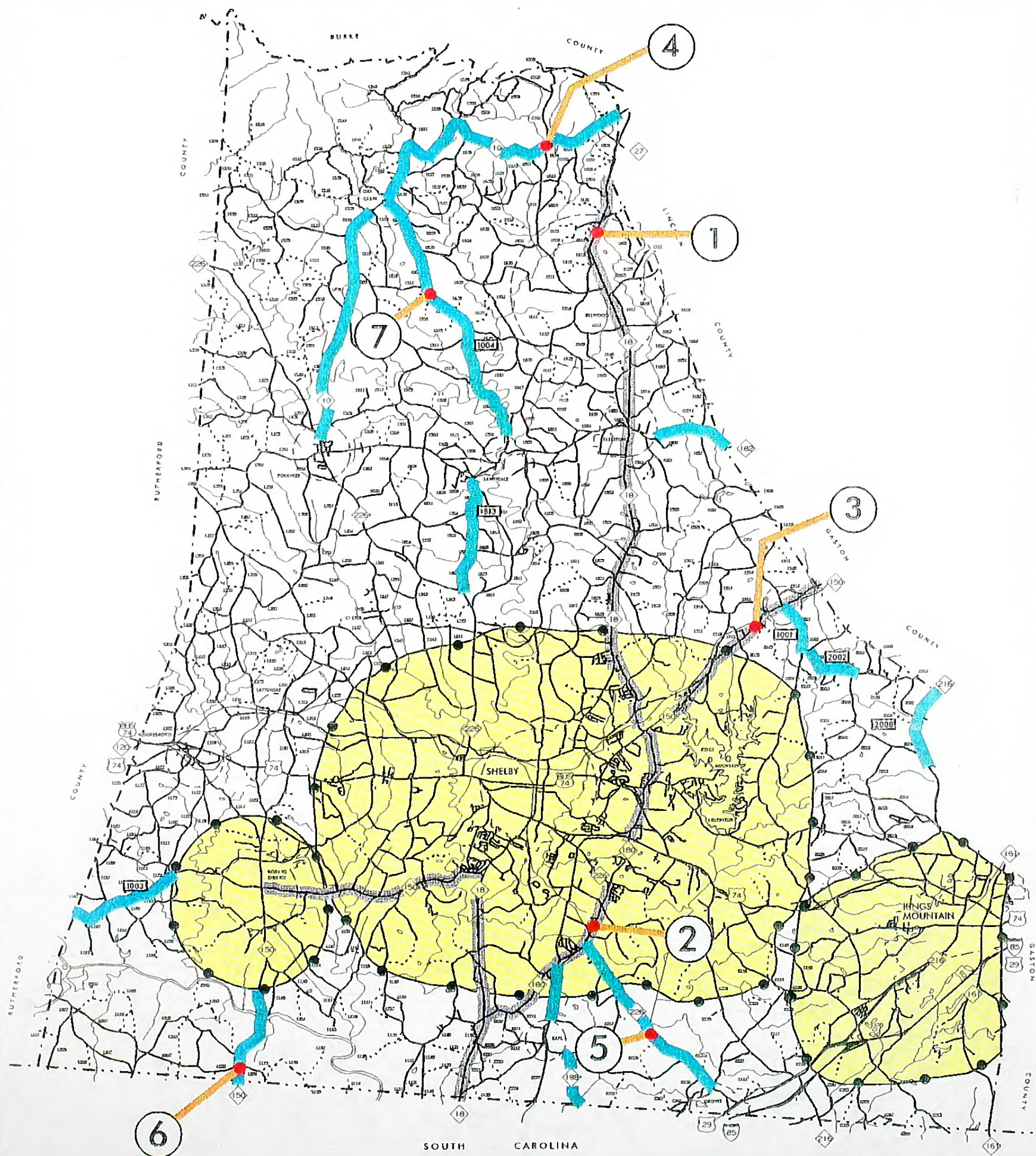
This plan documents the findings of a thoroughfare study for Cleveland County, below is a listing and brief description of the recommendations discussed in this report:

Minor Arterials

- 1) NC 18 - widen from a two-lane facility to a four-lane facility between the South Carolina Border and Lincoln County Line.
- 2) NC 180 - widen from a two-lane facility to a four-lane facility from the Patterson Crossing in Shelby to NC 18.
- 3) NC 150 - widen from a two-lane facility to a four-lane facility between the NC 18-NC 180 junction to the Gaston County Line.

Major Collectors

- 4) NC 10 - this facility should be widened to provide a minimum 7.32 m (24 ft) cross section to improve safety and operations.
- 5) NC 226 - this facility should be widened to provide a minimum 7.32 m (24 ft) cross section between Grover and NC 180.
- 6) NC 150 - this facility should be widened to provide a minimum 7.32 m (24 ft) cross section from South Carolina Line to Boiling Springs Planning Boundary in the south.
- 7) SR 1004 - this facility should be widened to provide a minimum 7.32 m (24 ft) cross section to improve safety and operations.



CLEVELAND COUNTY

NORTH CAROLINA

PREPARED BY
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS GIS UNIT
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION



EXECUTIVE SUMMARY RECOMMENDED IMPROVEMENTS LEGEND

Recommended Multilane Widening




Recommended Two-Lane 24ft. Cross Section



Urban Planning Area





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Chapter 1

Introduction

Overview

This report documents the findings of a study of Cleveland County's Thoroughfare System that began in 1995 and culminated in the mutual adoption of the 1996 Cleveland County Thoroughfare Plan. The adopted plan is shown in Figure 1.

Cleveland County is located in the southwestern portion of the state. The County is bounded on the north by Burke County, by Lincoln County on the east, by the South Carolina County of Cherokee on the south, and by Rutherford County on the west. The regional location of Cleveland County is shown in Figure 2.

In order to adequately plan for the future transportation needs of Cleveland County, the County Planning Director contacted the North Carolina Department of Transportation (NCDOT) and requested that a thoroughfare plan study be performed for the County. In the process of studying Cleveland County, the Statewide Planning Branch also decided to begin studies on two towns in Cleveland County, the municipalities of Boiling Springs and Kings Mountain. A report on Shelby, N.C. was completed in 1995.

In July 1995, the staff from Statewide Planning met with the local officials to determine the transportation needs of the area. The primary goal identified by the Cleveland County officials was to develop a plan that would coordinate with the plans of adjacent counties, as well as the thoroughfare plans adopted by the municipalities in the County.

The primary objective of thoroughfare planning is to enable the transportation network to be progressively developed to adequately meet the transportation needs of the County as land develops and traffic increases. The principles of basic thoroughfare planning, as described in Chapter 7 were used to develop this plan. Based on existing traffic, population, and land use data, the average daily traffic for the year 2020 was projected and used to determine systemwide capacity deficiencies. The recommendations for improvements to major and minor arterials and collectors were based on field investigations, existing and anticipated land uses, the expected system deficiencies and environmental considerations. The adopted Thoroughfare Plan is expected to meet the demands of Cleveland County for the planning period of 1995-2020.

Background

Cleveland County covers approximately 97,822 acres. Agriculture is the predominant industry throughout the County with farming concentrated in the northern portion of the County. Agricultural uses are varied and consist of truck crops, greenhouse and nursery crops, poultry and dairy livestock. Commercial areas are located in the municipalities with the largest concentration of commercial activity in Shelby along Highway 74. The highest concentration of industry is along the Interstate 85/Highway 29 corridor.

NCDOT has designated two sections of Highway 161 in Cleveland County as scenic corridors: the first beginning at the Interstate 85 intersection and Highway 226 North and the second beginning at Ramseur Church Road, running north through Polkville and beyond the County line.

Highlights

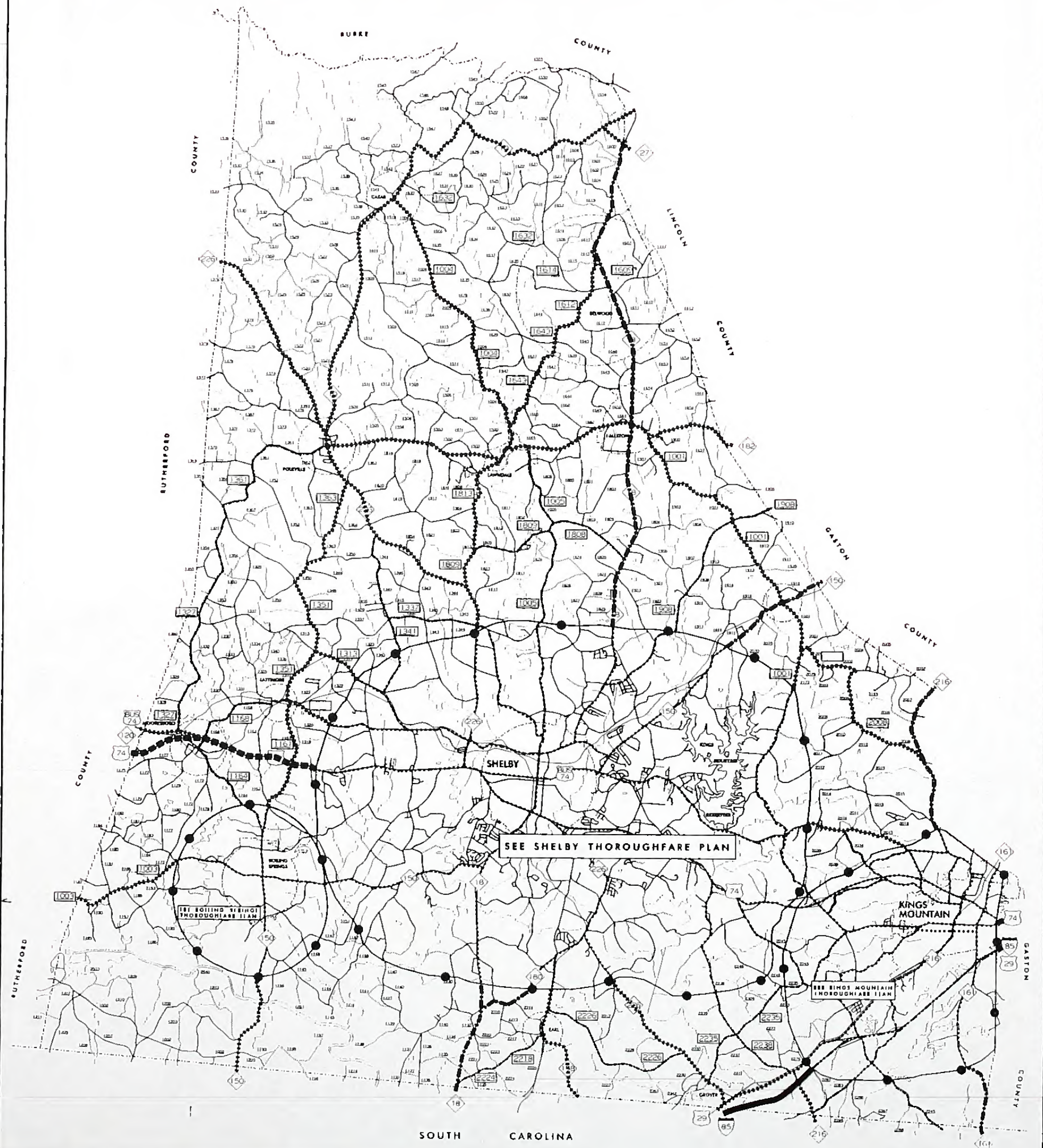
A complete analysis of the Cleveland County Thoroughfare Plan recommendations is located in Chapter 2. Some highlights of this thoroughfare plan are:

- 1) NC 18 - This major north-south route in Cleveland County is operating over and near capacity. It is recommended to widen NC 18 to a multilane facility.
- 2) NC 150 - This is a heavily traveled route because it serves Boiling Springs traffic to the south and the Towns of Cherryville and Lincolnton to the north. It is recommended to widen NC 150 to a multilane facility.
- 3) NC 180 - This 2-lane street connects NC 18 from the north to NC 18 in the south creating a loop to the east of Shelby. It is recommended to widen NC 180 from NC 226 to Patterson Crossing.

Other recommendations are covered in Chapter 2.

The North Carolina Department of Transportation and Cleveland County are jointly responsible for the proposed thoroughfare plan improvements. Cooperation between the state and local governmental units is of primary concern. The plan has been mutually adopted by all parties and it is the responsibility of the local government to implement the plan following the guidelines set forth in Chapter 3.

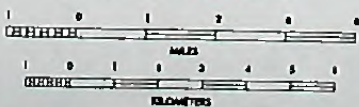
It should be emphasized that the adopted plan is based on anticipated growth of the area as currently perceived. Prior to the construction of projects, a more detailed study will be required to reconsider development trends and determine specific locations and design requirements.



CLEVELAND COUNTY

NORTH CAROLINA

PREPARED BY:
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-GIS UNIT
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION



RECOMMENDED THOROUGHFARE PLAN

ADOPTED BY:
CLEVELAND COUNTY
PUBLIC HEARINGS
RECOMMENDED BY:
STATEWIDE PLANNING
N.C. DEPARTMENT OF
TRANSPORTATION

APRIL 18, 1998

APRIL 15, 1998

JUNE 17, 1998

LEGEND

	EXISTING	PROPOSED
INTERSTATE		
OTHER PRINCIPAL ARTERIAL		
HIGHWAY ARTERIAL		
MAJOR COLLECTOR		
MINOR COLLECTOR		
URBAN PREPARED		
URBAN MAJOR		
URBAN PLANNING AREA		

Figure 1

GEOGRAPHIC LOCATION

FOR

CLEVELAND COUNTY NORTH CAROLINA

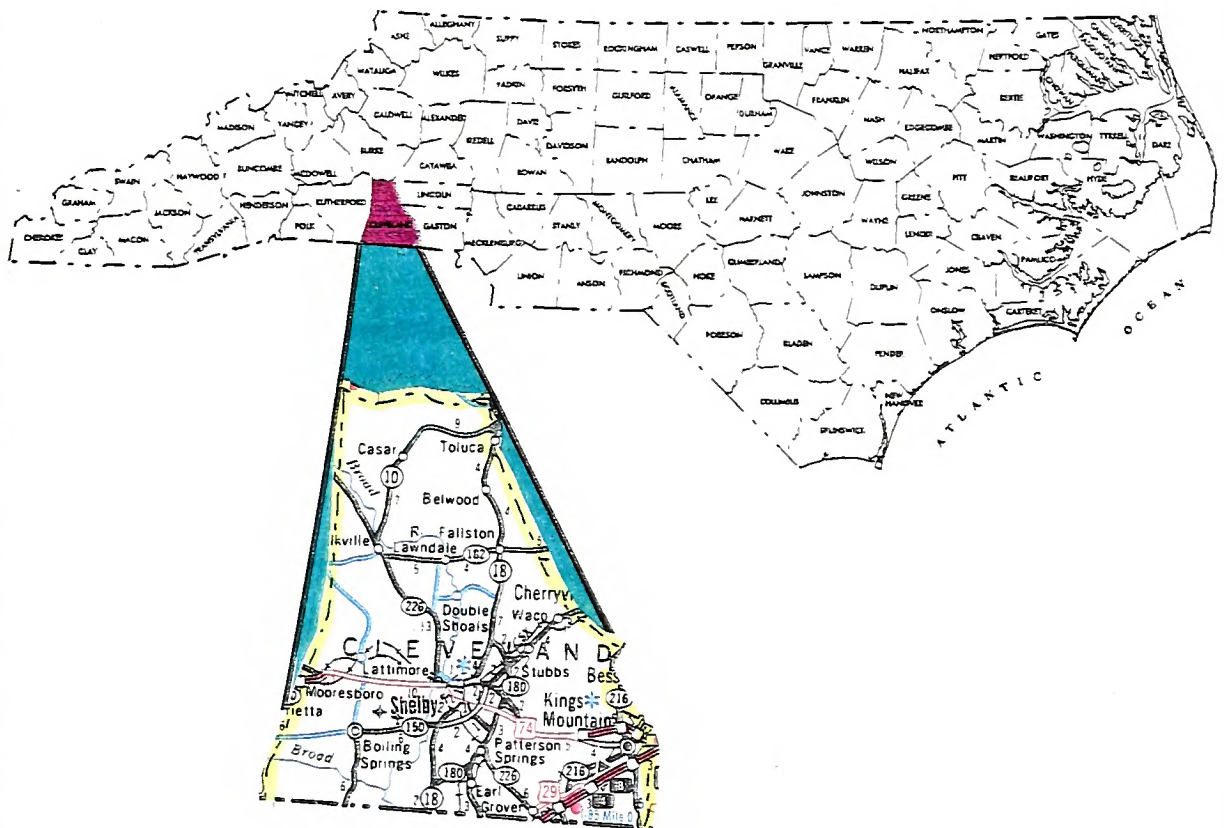


Figure 2

Chapter 2

Recommended Thoroughfare Plan

The availability of a good transportation facility can strongly influence the growth and development of a region and it is a necessary condition for human interaction and economic survival. The United States has constructed one of the most extensive transportation systems in the world, and as new developments occur this system will expand and improve. However, a major part of the effort will be to keep the existing system in serviceable condition.

A thoroughfare plan study uncovers the need for new facilities, and at the same time identifies existing and future deficiencies in the transportation system. A thoroughfare plan is a representation of the existing highway system by functional use. The various uses are classified as major arterials, minor arterials, collector street system, or the local street system. A full description of these various systems is given in Appendix A.

This chapter presents the thoroughfare recommendations based on the ability of the existing street system to serve present and future travel demands as the area continues to grow. The usefulness of transportation planning is in the analysis of different highway configurations for their efficiency in serving the area. The recommended plan sets forth a system of thoroughfares to serve the anticipated traffic and land development needs for Cleveland County. The primary goal of thoroughfare planning is to eliminate existing and projected system deficiencies that cause traffic congestion.

The recommended plan is based on the results of traffic forecasts that use data on traffic counts, population, housing, and employment. Each major road and highway in the county is analyzed to determine its ability to serve existing and future traffic demands. Recommendations to improve the transportation deficiencies in the system are then presented in the thoroughfare plan for the County.

Thoroughfare Plan Recommendations

The process of developing, testing and evaluating alternate plans involved several considerations. These included Cleveland County's goals and objectives, the identified roadway deficiencies (see Chapter 4), environmental impacts, existing and anticipated land development, and travel services. Aerial photography, topographic mapping, field reconnaissance and discussion with local staff, officials and interested local citizens provided additional basis for identifying and evaluating alternate alignments. The following is a list of recommendations for the interstate, arterial and collector routes in Cleveland County.

Interstate

I-85 - This is the only Interstate facility in Cleveland County. Currently no improvements are recommended.

Minor Arterial

NC 18 - This route is the only major north-south route in Cleveland County, it carries traffic from I-40 in Burke County to I-85 in Cleveland County. It is operating over capacity south of Fallston and near capacity north of Fallston. NC 18 carries traffic through the Central Business District of Shelby. In the Shelby Thoroughfare Plan which was adopted in April, 1995, parts of NC 18 is recommended to be widened. As part of this plan it is recommended to widen NC 18 to a multilane facility from the Lincoln County line through the Shelby Planning Area and continuing to the South Carolina border.

NC 180 - NC 180 is a 2-lane street connecting NC 18 from the north to NC 18 in the south creating a loop facility. NC 180 from NC 150 to NC 226 is in the current Transportation Improvement Program (TIP# U-2221) for widening to a multilane facility. In the Shelby Thoroughfare Plan it is recommended to widen this facility from NC 226 to Patterson Crossing. Since NC 180 is a loop to the east of Shelby it is recommended to continue widening of this facility from Patterson Crossing to NC 18 which will relieve traffic from the Central Business District of Shelby.

NC 150 - This is a heavily traveled route, serving Boiling Springs traffic to the south and the Towns of Cherryville and Lincolnton to the north. NC 150 from Cherryville to US 321 is in the TIP (U-2221) to be widened to a multilane facility. It is recommended to widen NC 150 to a multilane facility from the tie in point, west of Waco of the proposed Cherryville Bypass as shown in the Cherryville Thoroughfare Plan, to the Northern Planning Boundary of Shelby. In the Shelby Thoroughfare Plan, NC 150 is recommended for widening from the Planning Boundary to US 74 Bypass. NC 150 is operating near capacity in the Town of Boiling Springs and although the Shelby Thoroughfare Plan doesn't recommend Widening NC 150 to the West of Shelby toward Boiling Springs, widening of this portion to a multilane facility is recommended. Boiling Springs is a growing community with people who work in Shelby creating a lot of commuter traffic on NC 150. The section of NC 150 south that connects Boiling Springs to South Carolina is currently 20' wide, widen this section to 24' with shoulders.

US 74 - This facility is a major east-west facility that spans from I-85 in Gaston County through Cleveland County to I-40 in Asheville. It serves as the primary route of travel between Kings Mountain and Shelby. The Thoroughfare Plans for Kings Mountain and Shelby have been coordinated and detail the specific recommendations for this facility. The current TIP lists US 74 in Shelby to be widened to multi-lanes (R-2222) as well as construction of the US 74 Bypass around Shelby (R-2707).

Major Collector

NC 226- NC 226 runs from the Town of Grover in the south of Cleveland County to the Town of Lawndale in northern Cleveland County. This 2 lane facility has a lane width varying from 20 to 30 feet. The Average Daily Traffic on NC 226 warrants a 24 feet wide pavement with shoulders. Currently there is a proposal to build a lake adjacent to NC 226 for the City of Shelby's water supply. If the lake is built in this location, north of Polkville, it may warrant widening NC 226 to a multilane facility.

NC 216- NC 216 runs from the South Carolina border through Kings Mountain and extends into Gaston County. The existing cross-section from SR 2008 to the Gaston County border is 18 feet wide which is below the minimum standard lane width. It is recommended to widen this portion to 24 feet with 2' paved shoulders. Other recommendations for NC 216 are included in the Kings Mountain Thoroughfare plan.

NC 182- NC 182 connects the Towns of Fallston, Lawndale and Polkville. It extends from the Gaston County line west into Cleveland County and terminates in Polkville. These towns are projected to have industrial, commercial and residential growth. The lane width varies from 24' to 36' except the section from Fallston to the Gaston County line which is less than 24' wide. It is recommended to upgrade this portion to 24' wide with some improvements to the alignment of the road.

NC 198- This facility is a major collector and needs widening to 24' from the northern city limits of Earl to the South Carolina state line.

SR 1001 (Oak Grove Road)- This 2 lane facility is 18 feet wide. It does not meet the minimum standard criteria based on the Average Daily Traffic for this roadway. It should be widened to 24' with 2' paved shoulders from Waco to the Shelby planning boundary.

SR 1003 (Cliffside Road)- This facility extends from Boiling Springs to Rutherford County. The lane width changes from 40' to 20' as it leaves the Boiling Springs city limits. It is recommended to be widened from 20' to 24' wide to meet the minimum lane width criteria.

SR 1004 (Casar-Lawndale Road)- This 2 lane facility connects the Town of Lawndale to the Town of Casar in northern Cleveland County. The projected traffic for SR 1004 meets the requirement for a 24' wide road with shoulders. It is recommended to widen this facility to 24' wide and to improve the horizontal alignment just north of Lawndale, where an increase in residential and commercial growth is projected.

SR 1813 (Shelby Road)- This 2 lane 20' wide facility connects the southern city limits of Lawndale to NC 226. This area is projected to have residential growth in the design year. It doesn't meet the minimum standard lane width criteria and should be widened to a 24' wide facility.

Public Involvement

The Cleveland County Thoroughfare Plan was officially started in July 1995 by way of a joint meeting with representatives from the North Carolina Department of Transportation(NCDOT), the Cleveland County Commissioners and the Cleveland County Planning Board. On December 18, 1995 preliminary recommendations were presented to the Planning Board.

On February 15, 1996 a public drop-in session was held to discuss the findings of the Thoroughfare Plan study with the public. Upon recommendation of the Planning Board, these findings were presented to the Cleveland County Commissioners on March 19, 1996.

The Public Hearing was held on April 16, 1996. Everyone was in favor of the proposed recommendations. At the same meeting, the Cleveland County Commissioners adopted the plan unanimously. This plan was adopted by the North Carolina Board of Transportation on July 12, 1996.

Chapter 3

Implementation of the Thoroughfare Plan

Implementation is one of the most important aspects of the transportation plan. Unless implementation is an integral part of this process, the effort and expense associated with developing the plan is lost. There are several tools available for use by the County to assist in the implementation of the thoroughfare plan. They are as follows:

State-County Adoption of the Thoroughfare Plan

Cleveland County and the North Carolina Department of Transportation have mutually adopted the thoroughfare plan shown in Figure 1. The mutually approved plan may then serve as a guide for the Department of Transportation in the development of the road and highway system for the County. The approval of the plan by the County also enables standard road regulations and land use controls, outlined below, to be used effectively in the implementation of this plan.

Subdivision Controls

Subdivision regulations require every subdivider to submit to the County Planning Commission a plan of any proposed subdivision. It also requires that subdivisions be constructed to certain standards. Through this process, it is possible to require the subdivision streets to conform to the thoroughfare plan and to reserve or protect necessary right-of-way for projected roads and highways that are to become a part of the thoroughfare plan. The construction of subdivision streets to adequate standards reduces maintenance costs and simplifies the transfer of streets to the State Highway System. Appendix D outlines the recommended subdivision design standards as they pertain to road construction.

Land Use Controls

Land use regulations are an important tool in that they regulate future land development and minimize undesirable development along roads and highways. The land use regulatory system can improve highway safety by requiring sufficient setbacks to provide for adequate sight distances and by requiring off-street parking.

Development Reviews

Driveway access to a State-maintained street or highway is reviewed by the District Engineer's office and by the Traffic Engineering Branch of the North Carolina Department of Transportation. In addition, any development expected to generate large volumes of traffic (e.g., shopping centers, fast food restaurants, or large industries) may be comprehensively studied by staff from the Traffic Engineering Branch, Planning and Environmental Branch, and/or Roadway Design Unit of NCDOT. If done at an early stage, it is often possible to significantly improve the development's accessibility while preserving the integrity of the thoroughfare plan.

Funding Sources

Transportation Improvement Program

North Carolina's Transportation Improvement Program (TIP) is a document which lists all major construction projects the Department of Transportation plans for the next seven years. Similar to local Capital Improvement Program projects, TIP projects are matched with projected funding sources. Each year when the TIP is updated, completed projects are removed, programmed projects are advanced, and new projects are added.

During annual TIP public hearings, municipalities request projects to be included in the TIP. A Board of Transportation member reviews all of the project requests in a particular area of the state. Based on the technical feasibility, need, and available funding, the board member decides which projects will be included in the TIP. In addition to highway construction and widening, TIP funds are available for bridge replacement projects, highway safety projects, public transit projects, railroad projects, and bicycle projects. See Appendix B for the proper procedure concerning the acquisition of TIP funds and for a project's inclusion in the TIP.

Industrial Access Funds

If an industry wishes to develop property that does not have access to a state maintained highway and certain economic conditions are met, then funds may be made available for construction of an access road.

Small Urban Funds

Small Urban funds are annual discretionary funds made to municipalities with qualifying projects. The maximum amount is \$1,000,000 per year per division. A municipality may have multiple projects. Requests for Small Urban Fund assistance should be directed to the appropriate Board of Transportation member and Division Engineer.

Secondary Roads Programs

Nearly all secondary road improvements are done on a county by county basis. These funds are used to pave unimproved roads, widen roadways, stabilize dirt roads, make minor alignment improvements, and even construct short connectors when appropriate.

The North Carolina Highway Trust Fund Law

The Highway Trust Fund Law was established in 1989 as a plan with four major goals for North Carolina's roads and highways. These goals are:

1. To complete the remaining 2,768 km (1,716 mi.) of four lane construction on the 5,800 km (3,600 mi.) North Carolina Intrastate System.

2. To construct a multilane connector in Asheville and portions of multilane loops in Charlotte, Durham, Greensboro, Raleigh, Wilmington, and Winston-Salem.
3. To supplement the secondary roads appropriation in order to pave, by 1999, 16,100 km (10,000 mi.) of unpaved secondary roads carrying 50 or more vehicles per day, and all other unpaved secondary roads by 2006.
4. To supplement the Powell Bill Program.

In this 24-year planning period, Cleveland County should look forward to the paving of most, if not all, of its unpaved roads on the State maintained system in the Planning Area. Also, there will be an increase in a municipality's Powell Bill Funds if these newly paved roads are in its Corporate Limits.

For more information on the Highway Trust Fund Law, contact the Program Development Branch of the North Carolina Department of Transportation.

Implementation Recommendations

The following table provides a break down of the projects recommended in the Cleveland County Thoroughfare Plan and the corresponding method that would best suit the implementation of the given project. Appendix B gives an example of the proper procedure for the acquisition of TIP funds and for a project's inclusion in the TIP.

Table 1

Funding Sources and Methods Recommended for Implementation of Projects

Project	Funding Sources				Methods of Implementation				
	Local Funds	TIP Funds	Secondary Road Fund	Small Urban	T-fare Plan	Subdiv. Ord.	Zoning Ord.	Future Streets Lines	Development Review
NC 18 widening		X			X			X	X
NC 180 widening		X			X			X	X
NC 150 widening		X			X			X	X
NC 226 widening			X		X				
NC 182 widening			X		X				

Construction Priorities and Cost Estimates

Construction priorities will vary depending on what criteria are considered and what weight is attached to the various criteria. Most people would agree that improvements to the major thoroughfare system and major traffic routes would be more important than minor thoroughfares where traffic volumes are lower. To be in the North Carolina Transportation Improvement Program, a project must show favorable benefits relative to costs and should not be prohibitively disruptive to the environment. The potential cost estimate of three Cleveland County projects with respect to the user benefits, probability that economic development will be stimulated and environmental impacts is given in Table 4.

Reduced road user cost should result from any roadway improvement, from a simple widening to the construction of a new roadway to relieve congested or unsafe conditions. Comparisons of the existing and the proposed facilities have been made in terms of vehicle operating costs, travel time costs, and accident costs. These user benefits are computed as total dollar savings over the 24 year design period using data such as project length, base year and design year traffic volumes, traffic speed, type of facility, and volume/capacity ratio.

The impact of a project on economic development potential is shown as the probability that it will stimulate the economic development of an area by providing access to developable land and reducing transportation costs. It is a subjective estimate based on the knowledge of the proposed project, local development characteristics, and land development potential. The probability is rated on a scale from 0 (none) to 1.00 (excellent).

The environmental impact analysis considers the effect of a project on the physical, social/cultural, and economic environment. Below are listed the thirteen items that are considered when evaluating the impacts on the environment.

- * air quality
- * educational facilities
- * water resources
- * churches
- * soils and geology
- * parks and recreational facilities
- * wildlife
- * historic sites and landmarks
- * vegetation
- * public health and safety
- * neighborhoods
- * aesthetics
- * noise

The summation of both positive and negative impact probabilities with respect to these factors provides a measure of the relative environmental impacts of a project.

Offsetting the benefits that would be derived from any project is the cost of its construction. A new facility, despite its high projected benefits, might prove to be unjustified due to the excessive costs involved in construction. Table 3 shows the estimated cost of the major projects in the plan. The highway costs estimated in this report are based on the average statewide construction costs for similar project types. An estimate of anticipated right- of-way costs is also included. Table 4 evaluates the proposed Cleveland County projects with respect to user benefits, estimated costs, probability of economic development, and environmental impact. Table 2 may be used as a guideline for interpreting the "Probable Impact" values in Table 4.

Table 2

Probability Estimation Guide

Subjective Evaluation	Impact Probability
Excellent - very substantial	1.00
Very Good - substantial	0.75
Good - considerable	0.50
Fair - some	0.25
Poor - none	0.00

Table 3

Potential Project Cost Estimates for Major Projects

Project	Description	Construction (Millions)	Right of Way (100,000)	Total Cost (Millions)
1	NC 18 Widening	\$ 46,348	\$ 243,600	\$ 46,592
2	NC 180 Widening	\$ 5,924	\$ 36,400	\$ 5,924
3	NC 150 Widening	\$ 23,927	\$ 126,000	\$ 24,053

* cost estimates for Cleveland County Planning Area only

Table 4

Benefits Evaluation for Major Projects and Probable Impacts

Project	Benefits (millions)	Costs (millions)	Length (miles)	Benefits per Mile (1000's)	Economic Development Potential	Environmental Impact
NC 18 widening	87,361	46,592	24.32	3,592	0.50	+ 0.25 - 0.00
NC 180 widening	15,860	5,924	5.68	2,793	0.75	+ 0.20 - 0.50
NC 150 widening	133,957	24,053	12.39	10.811	0.25	+ 0.30 - 0.30

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Chapter 4

Analysis of Cleveland County's Roadway System

This chapter presents an analysis of the ability of the existing street system to serve the area's travel desires. Emphasis is placed not only on detecting the deficiencies, but on understanding their cause. Travel deficiencies may be localized and the result of substandard highway design, inadequate pavement width, or intersection controls. Alternately, the underlying problem may be caused by the system deficiency such as a need for a bypass, loop facility, construction or missing links, or additional radials.

Current Thoroughfare Plans for Cleveland County

Thoroughfare plans are a tool to aid officials in the development of an appropriate street system. It is important that the communities within a County, and County officials cooperate as a team in the development of this transportation system. Plan development and implementation jointly undertaken will help ensure the development of an efficient system for travel throughout the County. The following thoroughfare studies have been recently completed for Cleveland County:

1. City of Shelby, plan adopted in November of 1994. This plan contains the proposed US 74 bypass which is a four lane divided freeway on new location (TIP# R2707).
2. The Town of Kings Mountain, plan adopted June 25, 1996 and The Town of Boiling Springs, plan adopted October 1, 1996.

Transportation Improvement Program Projects

As covered in Chapter 3, the Transportation Improvement Program (TIP) is a seven year project planning document that lists the major transportation improvement projects that the Department of Transportation has planned. These projects include not only roadway projects, but also bridge projects, railroad crossings, bicycle facilities, and public transportation. Cleveland County has several roadway projects identified in the 1996-2001 TIP, these projects are listed below:

1. US 74, Dixon Avenue, US 74 Business west of Shelby to US 74 Business east of Shelby. Widen existing roadway to six lanes.
2. US 74 Bypass, Shelby. Four lane divided freeway on new location.
3. New Route, north of I-85 interchange with SR 2283 (Dixon School Road.) to US 74 Bus. Two lane facility on new location.
4. NC 180, NC 226 to NC 150. Widen road to a multi-lane facility.
5. US 74-NC 150 (Dekalb street). Construct interchange.

Existing Travel Patterns and Deficiencies

Traffic Demand

Travel demand is generally reported in the form of average daily traffic counts. Traffic counts are taken regularly at several locations in Cleveland County by the North Carolina Department of Transportation. The 1994 average daily traffic compared with capacity is shown in Figure 3.

Width and Alignment Deficiencies

North Carolina's standard for highway construction calls for 3.4 m (11 ft) lanes on all highways with traffic volumes greater than 2000 ADT (average daily traffic) or design speeds greater than 50 miles per hour, including all primary arterials. A minimum lane width of 2.7 m (9 ft) can be tolerated on collector roads with an ADT of less than 400 vehicles per day. Minimum level of service for minor collector roads dictate a 25 km/h (40 mph) average travel speed during peak traffic conditions.

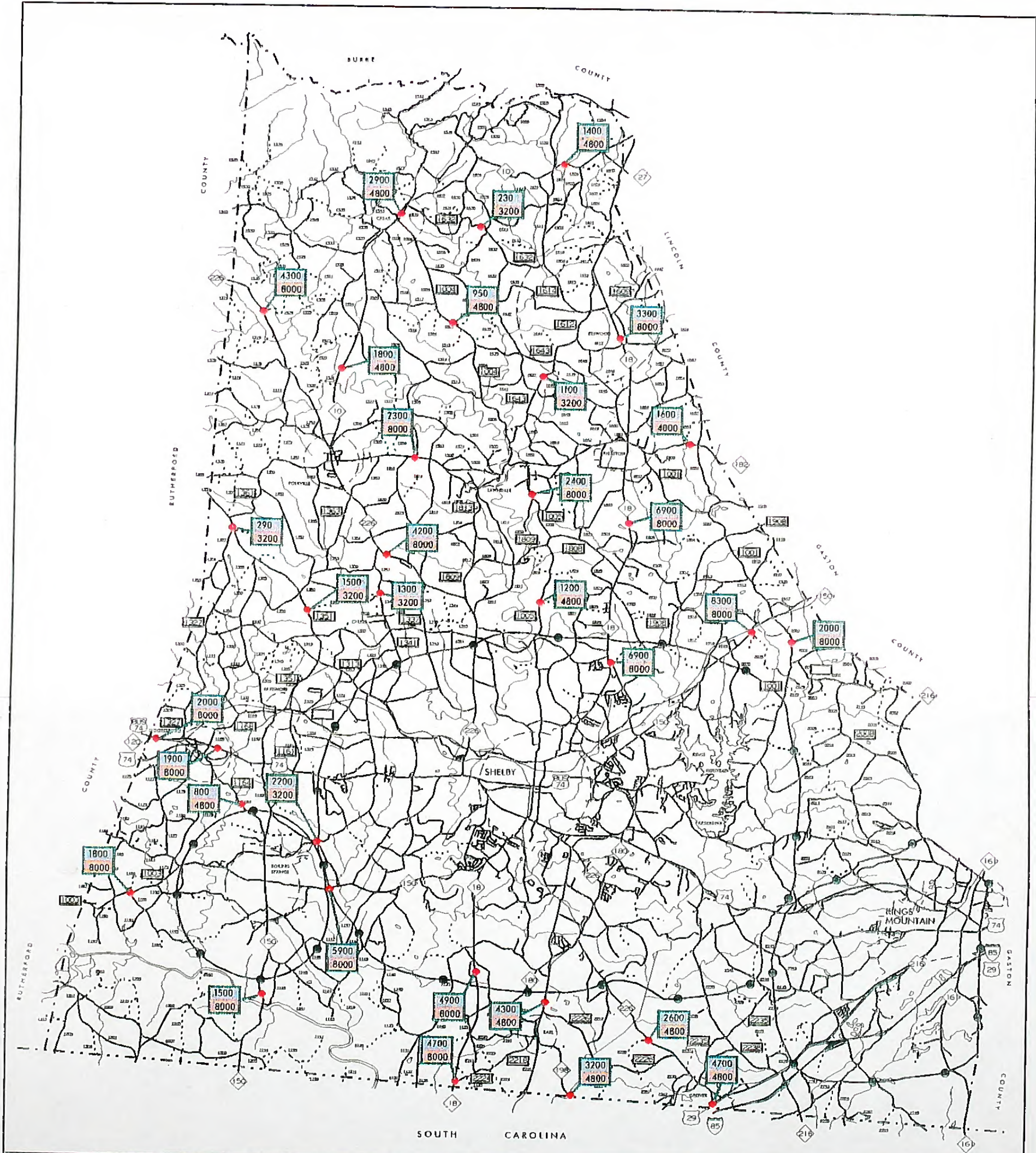
Design requirements for thoroughfares vary according to the desired capacity and level of services to be provided. Universal standards in the design of thoroughfares are not practical. Each road or highway section must be individually analyzed and its design requirements determined on the basis of amount and type of projected traffic, existing capacity, desired level of service, and available right-of-way.

The level of service is a function of the ease of movement experienced by motorists using the facility. The ability of a motorist to drive at a desired speed is dependent upon the physical design of the road, the amount and character of traffic control devices, the influence and character of traffic generated by abutting property, and imposed speed restrictions. The level of service is generally indicated by the overall travel speed experienced by traffic. Recommended minimum levels of services for roads and highways included in the proposed Cleveland County Thoroughfare Plan are given in Table 5.

Table 5

Minimum Levels of Service for Roads and Highways

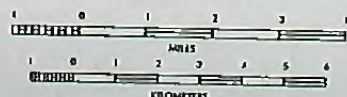
Facility	Overall Travel Speed During Peak Traffic Conditions	
	km/h	mph
Major & Minor Arterials	31 - 34	50 - 55
Major Collector Roads	28 - 31	45 - 50
Minor Collector Roads	25	40



CLEVELAND COUNTY

NORTH CAROLINA

PREPARED BY
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-GIS UNIT
BY COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION



1994 TRAFFIC VOLUMES
OVER 1994 ROADWAY
CAPACITIES

LEGEND

1994 Volume
1994 Capacity



Planning Area



From the standpoint of driver's convenience, ease of operations, and safety, it would be desirable to widen all existing roads and highways to provide a minimum lane width of 3.6 m (12 ft). However, when considering overall statewide needs and available highway revenues, it is found that these levels of improvement applied statewide would be impractical. It is necessary, therefore, to establish minimum tolerable widths for existing roads with respect to traffic demands which would be economically feasible.

Table 6 gives the widths used in determining the existing lane deficiencies in the County.

Table 6

Minimum Tolerable Lane Widths

ADT	Principal Arterials		Minor Arterials		Collectors	
	(m)	(ft)	(m)	(ft)	(m)	(ft)
Over 2000	3.4	11	3.4	11	3.4	11
400 - 2000	--	--	3.0	10	3.0	10
100 - 400	--	--	3.0	10	2.7	9
Below 100	--	--	--	--	2.7	9

An analysis of roadways in the Cleveland County planning area was made to determine if the projected traffic (year 2020) would exceed the practical capacity of the system.

There are a number of roads in the Cleveland County Planning Area that have or are expected to have substandard widths. Because of the substantial cost of upgrading all secondary roads to the standard, narrow widths may have to be tolerated until sufficient funds are available to provide for improvements. The roads identified as substandard in Cleveland County's Thoroughfare Plan Study are listed below:

- * NC 18: Lincoln Co. Line - South Carolina Line
- * NC 150: South Carolina Line - SPB Boiling Springs
- * NC 180: Shelby Southern City Limit - South Carolina Line
- * NC 10: Polkville Northern City Limit - Lincoln Co. Line
- * NC 226: Western City Limit of Grover - NC 180
- * NC 182: Gaston Co. Line - Eastern City Limit of Fallston
- * NC 198: South Carolina Line - Eastern City Limit of Earl
- * SR 1004: NC 10 - Northern City Limit of Lawndale
- * SR 1813: Southern City Limit of Lawndale - NC 226
- * SR 1003: Rutherford Co. Line - Boiling Springs Eastern City Limit
- * SR 1001: NC 150 - SR 2001

When funds are available for widening, the following priority is recommended:

- 1) NC 18
- 2) NC 180
- 3) NC 150
- 4) NC 10
- 5) NC 226

Capacity Analysis of the Existing System

An indication of the adequacy of the existing major street system is a comparison of the traffic volumes with the ability of the streets to move traffic freely at a desirable speed. The ability of a street to move traffic freely, safely, and efficiently with a minimum delay is controlled primarily by the spacing of major devices utilized. Thus, the ability of a street to move traffic can be increased by restricting parking and turning movements, using proper sign and signal devices, and by the application of other traffic engineering techniques.

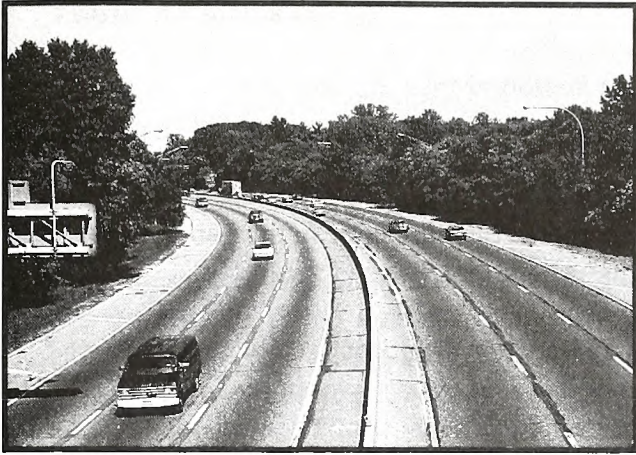
Capacity is the maximum number of vehicles that has a reasonable expectation of passing over a given section of a roadway in one direction, or in both directions, during a given period under prevailing roadway and traffic conditions (1). The relationship of traffic volumes to the capacity of the roadway will determine **level of service** being provided. Six levels of service have been selected for analysis purposes. They are given letter designations from A to F. Level-of-service (LOS) A represents the best operating conditions and level-of-service F the worst.

The six levels of service are illustrated in Figure 4, and they are defined on the following pages. The definitions are general and conceptual in nature, but may be applied to urban arterial levels of service. Levels of service for interrupted flow facilities vary widely in terms of both the user's perception of service quality and the operational variables used to describe them. The 1994 Highway Capacity Manual contains more detailed descriptions of the levels of service as defined for each facility type.

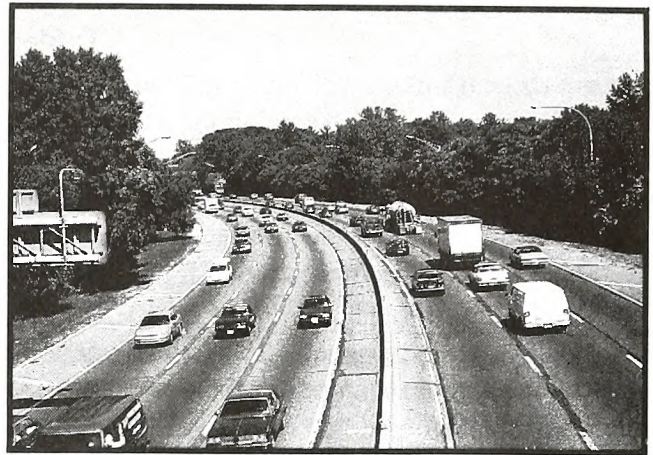
1994 Traffic Capacity Analysis

Figure 3 depicts the base year (1994) major street system and the ADT (Average Daily Traffic). A comparison of the base year ADT to capacities lists some roadways near or over practical capacity. The capacities for these facilities were determined by using the speeds associated with the facility types shown in Table 5 and the 1994 Highway Capacity Manual.

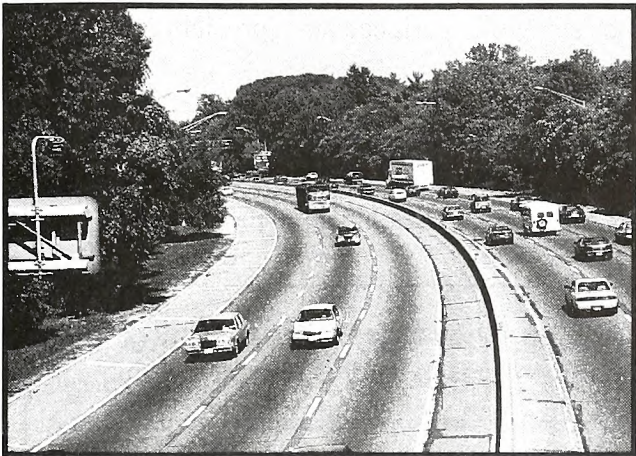
¹ Highway Capacity Manual, Special Report 209, 1-4, 1994



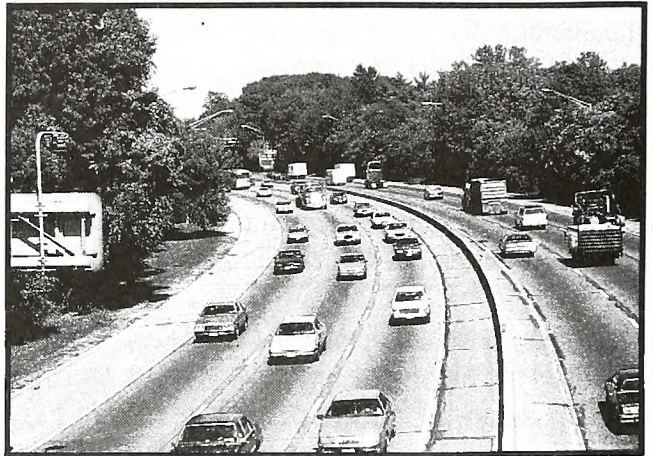
LOS A.



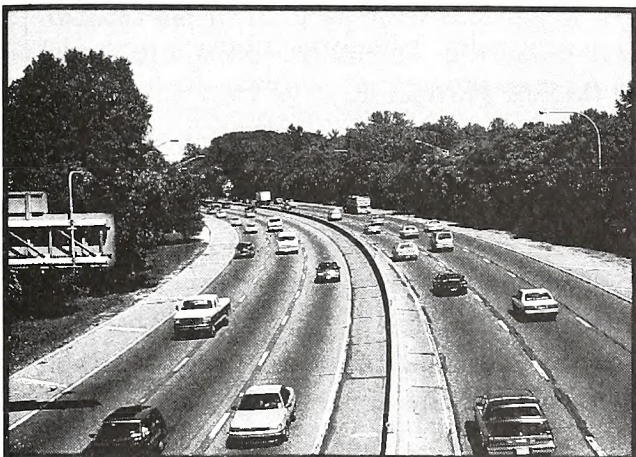
LOS D.



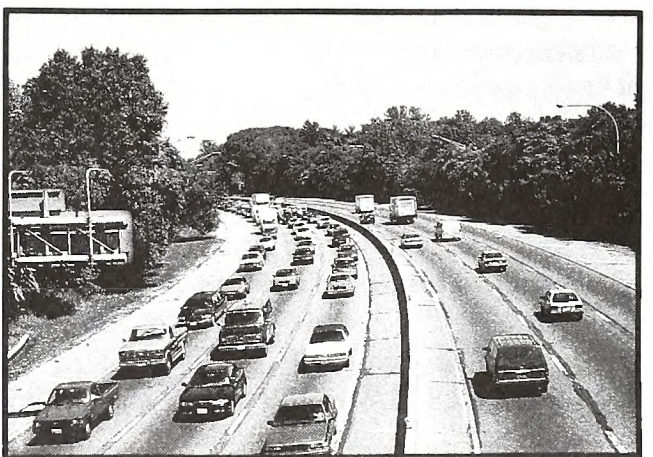
LOS B.



LOS E.



LOS C.



LOS F.

Table 7

Level of Service

LOS A - Describes primarily free flow-operations at average travel speeds usually about 90 percent of the free-flow speed for the arterial class. Vehicles are completely unimpeded in their ability to maneuver within the traffic stream. Stopped delay at signalized intersections is minimal.

LOS B - Represents reasonable unimpeded operations at average travel speeds usually about 70 percent of the free-flow speed for the arterial class. The ability to maneuver within the traffic stream is only slightly restricted and stopped delays are not bothersome. Drivers are not generally subjected to appreciable tension.

LOS C - Represents stable operations. However, ability to maneuver and change lanes in mid-block locations may be more restricted than in LOS B, and longer queues and/or adverse signal coordination may contribute to lower average travel speeds of about 50 percent of the average free-flow speed for the arterial class. Motorists will experience an appreciable tension while driving.

LOS D - Borders on a range on which small increases in flow may cause substantial increases in approach delay and, hence, decreases in arterial speed. Delay may be due to adverse signal progression, inappropriate signal timing, high volumes, or some combination of these. Average travel speeds are about 40 percent of free-flow speed.

LOS E - The boundary between LOS D and LOS E describes operation at **capacity**. Operations at this level are extremely unstable, because there are virtually no gaps in the traffic stream. Any disruption to the traffic stream, such as a vehicle entering from a ramp, or changing lanes, requires the following vehicles to give way to admit the vehicle. This condition establishes a disruption wave which propagates through the upstream traffic flow. At capacity, the traffic stream has no ability to dissipate any disruption. Any incident can be expected to produce a serious breakdown with extensive queuing.

LOS F - Describes forced or breakdown flow. The arterial flow is at extremely low speeds - below one-third to one-quarter of the free-flow speed. Intersection congestion is likely at critical signalized locations, with high approach delays resulting. Adverse progression is frequently a contributor to this condition.

Traffic Accidents

High accident locations are very important to a Thoroughfare Plan. Traffic accident records are of assistance in defining problem areas and often pinpoint a deficiency such as poor design, inadequate signing, ineffective parking, or poor sight distance. Accident patterns developed from analysis of accident data can lead to remedial action reducing the number of accidents.

Both the severity and number of accidents should be considered when investigating accident data. The severity of every accident is measured with a series of weighting factors developed by NCDOT's Division of Highways. In terms of these factors, a fatal or incapacitating accident is 47.7 times more severe than one involving only property damage. An accident resulting in minor injury is 11.8 times more severe than one with only property damage. Table 8 is a summary of accidents in the Cleveland County Planning Area from 1/1/92 to 12/31/95. The "Total" column indicates the total number of accidents reported within one hundred (100) feet of the intersection during the indicated time period. The severity listed is the average accident severity for that location.

Table 8

Locations with 15 or More Accidents in a 3 Year Period

Location	Total	Severity
1) US 74 and SR 1161	27	4.24
2) NC 18 and NC 180	15	4.70
3) US 180 and NC 226	31	5.12

As a part of this study, these accident locations were reviewed by the Statewide Planning Unit. None of these intersections warranted any improvements. To request a more detailed analysis for any of the above intersections, the County should contact the Division 12 Traffic Engineer.

Existing Bridge Conditions

Bridges are a vital and unique element of a highway system. First, they represent the highest unit investment of all elements of the system. Second, any inadequacy or deficiency in a bridge reduces the value of the total investment. Third, a bridge presents the greatest opportunity of all potential highway failures for disruption of community welfare. Finally, a bridge represents the greatest opportunity of all highway failures for loss of life. For these reasons, it is imperative that bridges be constructed to the same design standards as the system of which they are a part.

Congress enacted the National Bridge Inspection Program Standards on April 27, 1971, implementing the Federal Highway Act of 1968. These standards require that "all structures designed as bridges located on any of the Federal-Aid Highway Systems be inspected and the safe load carrying capacity computed at regular intervals, not to exceed two years." A sufficiency index number has been calculated for each bridge to establish eligibility and priority for replacement. The bridges with the highest priority are replaced as Federal-Aid Funds and State Funds become available.

The North Carolina DOT Bridge Maintenance Unit, with assistance from various consultants, inspects all bridges on the State Highway System. All the bridges in Cleveland County have been analyzed, rated, and inventoried. The resulting data has been reduced to a more readily usable form as a management tool.

A sufficiency rating was used in the analysis to determine the deficiency of each bridge. The sufficiency rating is a method of evaluating factors that determine whether a bridge is sufficient to remain in service. Factors used include:

- * structural adequacy and safety
- * serviceability and functional obsolescence
- * essentiality for public use
- * type of structure
- * traffic safety features

The result of this method is a percentage in which 100 percent represents an entirely sufficient bridge and zero percent represents an entirely insufficient or deficient bridge sufficiency rating of 50 percent or less qualifies for Federal Bridge Replacement Funds.

Deficient bridges are categorized as either functionally obsolete or structurally deficient. Bridges in the functionally obsolete category have below average ratings in approach roadway alignment, under clearance, deck geometry, waterway adequacy, or structural condition. Structurally deficient bridges have below average ratings in deck superstructure, substructure, overall structural condition, or waterway adequacy. Table 9 shows the functionally obsolete bridges in Cleveland County. Table 10 shows the structurally deficient bridges in Cleveland County.

Table 9

Functionally Obsolete Bridges in Cleveland County

Bridge No.	Facility Carried	Location	Rating
15	NC 180	0.3 Mi. N of Jct NC 150	49.4
53	SR 2281	0.3 Mi. N of Jct SR 2283	45.5
56	NC 226	0.1 Mi. S of Jct SR 1307	46.1
106	SR 1202	0.2 Mi. W of Jct SR 1203	49.2
129	SR 1184	0.4 Mi. E of Jct SR 1245	47.7
141	SR 1325	0.3 Mi. S of Jct SR 1334	36.3
154	NC 1905	0.1 Mi. E of Jct SR 1001	40.2
162	SR 1612	0.1 Mi. W of Jct SR 1652	46.2
165	SR 1635	1.3 Mi. E of Jct SR 1670	46.3
174	SR 1632	0.5 Mi. W of Jct SR 1630	46.3
182	SR 1637	0.7 Mi. N of Jct SR 1639	36.2
192	SR 1662	0.3 Mi. E of Jct SR 1643	36.3

Table 10

Ten Most Structurally Deficient Bridges

Bridge No.	Facility Carried	Location	Rating
35	SR 1001	0.5 Mi. N of Jct. SR 2033	17.0
66	NC 226	0.05 Mi. N of Jct. SR 1305	22.4
114	SR 1195	1.3 Mi. E of Jct. SR 1186	21.8
122	SR 1152	0.4 Mi. N of Jct. SR 1123	28.0
189	SR 1639	0.8 Mi. W of Jct. SR 1637	23.8
190	SR 1005	0.1 Mi. S of Jct. SR 1806	22.2
202	SR 1639	0.5 Mi. E of Jct. SR 1640	21.8
230	SR 1908	0.1 Mi. S of Jct. SR 1918	27.7
301	SR 1645	0.5 Mi. N of Jct. SR 1646	23.8
358	SR 1527	0.8 Mi. S of Jct. SR 1529	19.0

The following bridges are included on the current Transportation Improvement Program:

- * **First Broad River. Replace Bridge No.10**
- * **Beaverdam Creek. Replace Bridge No. 42**
- * **I-85/US 29. Replace Bridge No.14**
- * **Buffalo Creek. Replace Bridge No.13**
- * **Seaboard Coastline Railroad. Replace Bridge No.56**
- * **Persimmon Creek. Replace Bridge No.35**
- * **Beaverdam Creek. Replace Bridge No.122**
- * **Sandy Run Creek. Replace Bridge No.114**
- * **Beaverdam Creek. Replace Bridge No.139**
- * **Sandy Run Creek. Replace Bridge No.133**
- * **First Broad River. Replace Bridge No.179**
- * **No Business Creek. Replace Bridge No.273**
- * **Buffalo Creek. Replace Bridge No.230**
- * **Kings Creek. Replace Bridge no.50**
- * **Gidney Street Over Hickory Creek. Replace Bridge No.108**

Future Travel Demand

Future travel demand can be forecasted by looking at past traffic trends and calculating the average annual growth rates along any particular route. Average traffic growth in Cleveland County ranges from a high of 5.8% per year to a low of less than 1.0% per year. Specifically, NC 18 grew at 5.1% between 1977 and 1987, on average NC routes in Cleveland county had a growth rate of 2.0% to 2.5%. Using these past trends along with projected land uses and forecasted population growth, the transportation planner is able to forecast future travel demand and to predict where future problems may occur. For the purposes of this study, NC 18 was projected to grow at 2.5%, Figure 5 and Appendix A provide forecasted traffic for major and minor roads in Cleveland County.

Capacity Deficient Corridors

Capacity Deficient Corridors were determined using the volume/capacity ratio (V/C), with the projected traffic over the practical capacity of the facility. A V/C ratio higher than one is considered over capacity, and V/C between 0.80 and 0.99 is considered near capacity, but still tolerable. Based on this analysis, several roadways in Cleveland County are anticipated to be near or over capacity by the planning year 2020.

These routes are shown in red and green on Figure 6, and include:

NC 18: Lincoln Co. Line - NC 180, NC 150 - South Carolina Line

NC 180: NC 226 - NC 18

NC 150: Gaston Co. Line - NC 180, NC 18 - Eastern City Limits of Boiling Springs

Traffic congestion on these routes can be alleviated by widening as discussed in Chapter 2.

Figure 5 shows the existing system assuming that no improvements are made by the design year. Figure 6 shows areas shows the Cleveland County Areas expected to be over and near capacity in 2020.

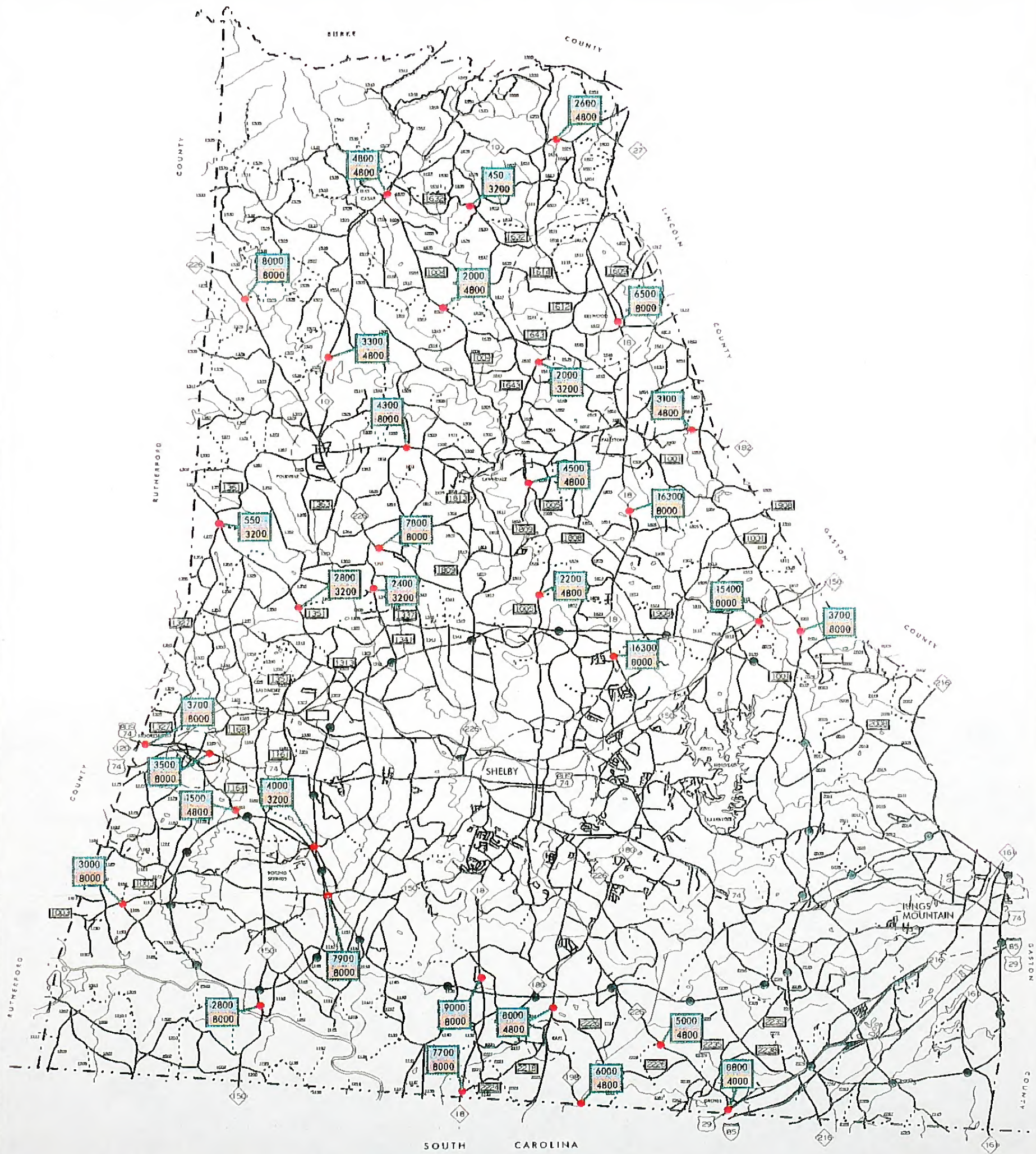
System Deficiencies

System deficiencies result from a lack of a cohesive, continuous, and complimentary major street network. More simply put, a system deficiency exists when drivers must go out of their way to get from point A to point B, or when the path for getting there is not cohesive or continuous.

The thoroughfare plan study identified a system deficiency for traffic traveling North-South on NC 18. As discussed in Chapter 2, the improvement and widening of NC 18 all the way from North of Cleveland County to the south will improve the continuity of the roads and will create a multilane road that extends to Interstate 40 on the north and Interstate 85 on the south.

Intersection Deficiencies

Problems with intersection design or control can contribute to poor movement of traffic, increased traffic accidents, and driver irritation. Most of the major traffic intersections within Cleveland County are located within the small urban areas throughout the County.



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PROJECTED
2020 TRAFFIC VOLUMES
OVER 1994 ROADWAY
CAPACITIES

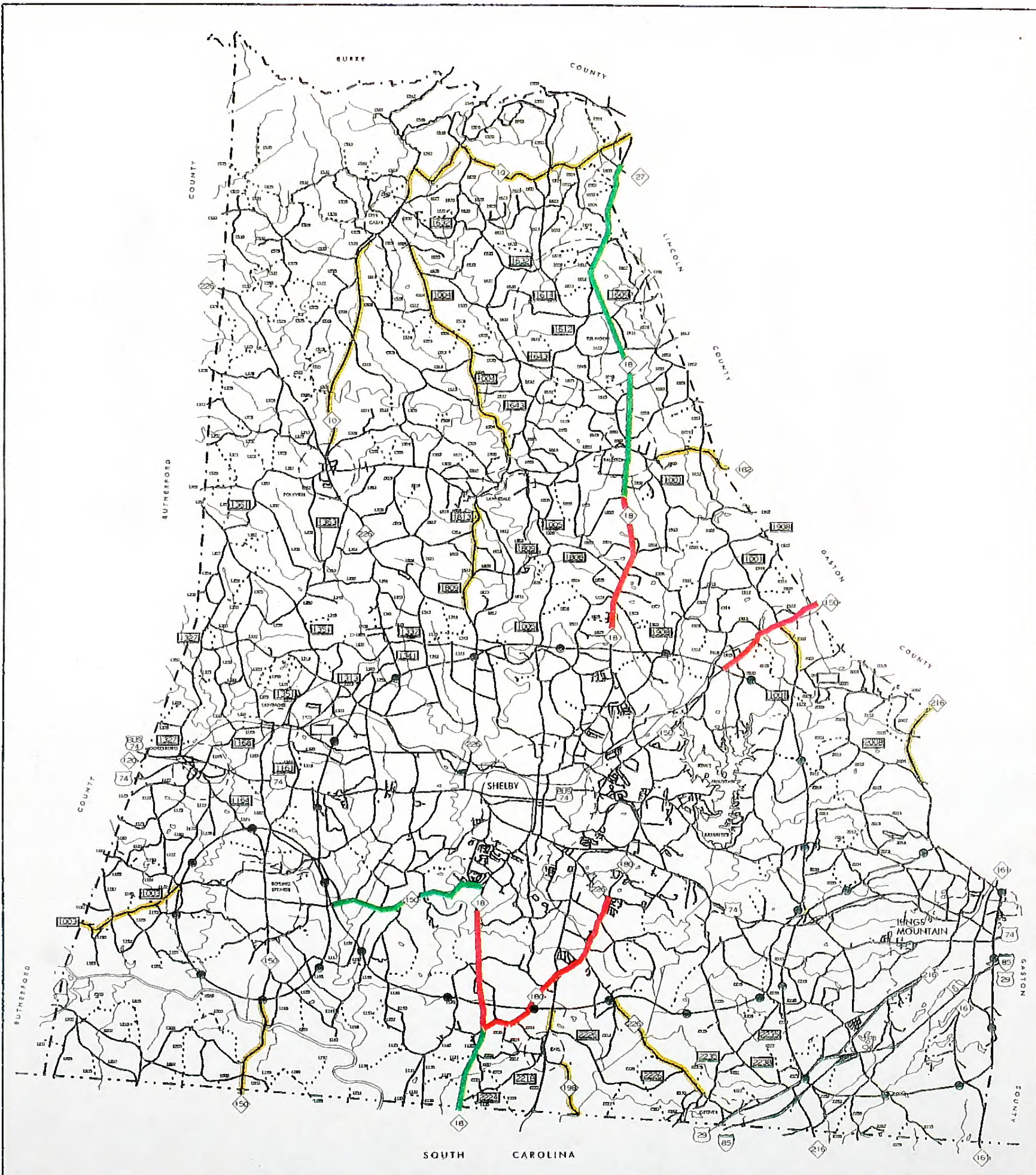
LEGEND

2020 Volume
1994 Capacity



Planning Area

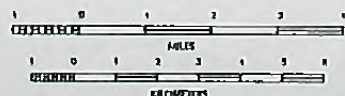




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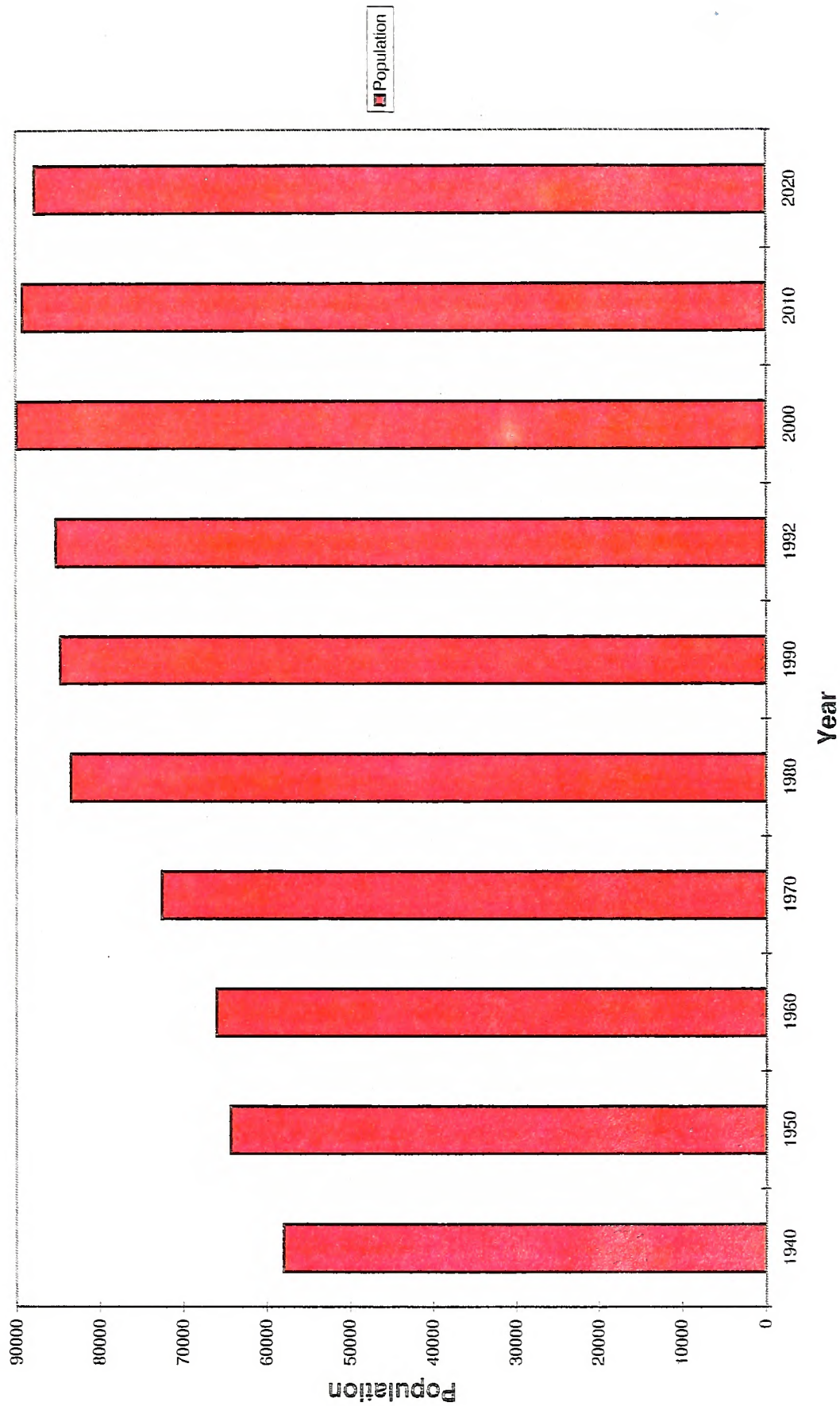
2020 ROADWAY DEFICIENCIES

LEGEND

- VOLUME CAPACITY = 0.81-0.99 —
- VOLUME CAPACITY > 1.0 —
- SUBSTANDARD ROADWAY WIDTH —
- URBAN PLANNING AREA ●

FIGURE 6

Population Trend for Cleveland County



Graph 1



Land Use

Land use refers to the physical patterns of activities and functions within the city. Nearly all traffic problems in a specific area are relative to the area's land use. The amount of traffic on a particular street is very closely related to its adjacent land use. For example, a large industrial plant might be the cause of congestion during shift change hours as its workers come and go. However, during the remainder of the day, few problems if any, may occur. The spatial distribution of different types of land use (sometimes referred to as traffic generators) is the predominant determinant of when, where, and why congestion occurs. The attraction between different land uses and their association with travel varies depending on the size, type, intensity, and spatial separation of each.

For use in transportation planning, land uses are grouped into four categories:

1. **Residential** - all land devoted to the housing of people except hotels and motels
2. **Commercial** - all land devoted to retail trade including consumer, business services and offices
3. **Industrial** - all land devoted to manufacturing, storage, warehousing, and transportation of products
4. **Public** - all land devoted to social, religious, educational, cultural, and political activities.

Cleveland County has an area of 299,621 acres, residential development takes up 30,373 acres. The largest concentration of residential development is in South Central Cleveland. Commercial uses are predominantly located in the municipalities. Agriculture covers approximately 97,882 acres and it is one of the leading industries in the County.

Recreational area and open space covers approximately 866 acres. There are many recreational facilities throughout the County. The most recent facility is the Broad River Greenway which consists of 423 acres of trails, picnic shelters and natural open space. The Broad River Greenway is located off of NC 150 in the southern portion of Cleveland County close to the South Carolina Border. Phase one of this facility is estimated to start in the fall of 1995.

Chapter 6

Environmental Concerns

In the past several years, environmental considerations associated with highway construction have come to the forefront of the planning process. The legislation that dictates the necessary procedures regarding environmental impacts is the National Environmental Policy Act. Section 102 of this act requires the execution of an environmental impact statement, or EIS, for road projects that have a significant impact on the environment. Included in an EIS would be the project's impact on wetlands, water quality, historic properties, wildlife, and public lands. While this report does not cover the environmental concerns in as much detail as an EIS would, preliminary research was done on several of these factors and is included below.

Wetlands

In general terms, wetlands are lands where saturation with water is the dominant factor in determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. The single feature that most wetlands share is soil or substrate that is at least periodically saturated with or covered by water. Water creates severe physiological problems for all plants and animals except those that are adapted for life in it or in saturated soil.

Wetlands are crucial ecosystems in our environment. They help regulate and maintain the hydrology of our rivers, lakes, and streams by slowly storing and releasing flood waters. They help maintain the quality of our water by storing nutrients, reducing sediment loads, and reducing erosion. They are also critical to fish and wildlife populations. Wetlands provide an important habitat for about one third of the plant and animal species that are federally listed as threatened or endangered.

In this study, the impacts to wetlands were determined using the National Wetlands Inventory Mapping (NWI) available from the U.S. Fish and Wildlife Service.

Wetland impacts have been avoided or minimized to the greatest extent possible while preserving the integrity of the transportation plan.

Based on the information gathered from the NWI for Cleveland County there are limited wetland areas in the County. The concentration of the wetlands are to the east of Shelby and from the preliminary analysis the proposed improvements will not impact wetlands. Figure 7 has the environmental data for Cleveland County.

Threatened and Endangered Species

A preliminary review of the Federally Listed Threatened and Endangered Species within Cleveland County was done to determine the effects that new corridors could have on the wildlife.

These species were identified using mapping from the North Carolina Department of Environment, Health, and Natural Resources.

The Threatened and Endangered Species Act of 1973 allows the U. S. Fish and Wildlife Service to impose measures on the Department of Transportation to mitigate the environmental impacts of a road project on endangered plant and animals and critical wildlife habitats. By locating rare species in the planning stage of road construction, we can avoid or minimize these impacts.

There are several federally listed threatened or endangered species in Cleveland County. From a preliminary analysis, none of the proposed Cleveland County projects will impact any threatened or endangered species. A detailed field investigation is recommended prior to construction of any highway project in the county.

Historic Sites

The location of historic sites in Cleveland County was investigated to determine the possible impact of the various projects studied. The federal government has issued guidelines requiring all State Transportation Departments to make special efforts to preserve historic sites. In addition, the State of North Carolina has issued its own guidelines for the preservation of historic sites. These two pieces of legislation are described below:

National Historic Preservation Act - Section 106 of this act requires the Department of Transportation to identify historic properties listed in the National Register of Historic Places and properties eligible to be listed. The DOT must consider the impact of its road projects on these properties and consult with Federal Advisory Council on Historic Preservation.

NC General Statute 121-12(a) - This statute requires the DOT to identify historic properties listed on the National Register, but not necessarily those eligible to be listed. DOT must consider impacts and consult with the North Carolina Historical Commission, but is not bound by their recommendations.

There are currently seven structures in the Cleveland County Planning Area that are listed on the National Register of Historic Places. They are as follows:

- | | |
|-------------------------------|-------------------------|
| * Cleveland County Courthouse | * Clyde Hoey Home |
| * Plato Durham House | * Anthony Meagher House |
| * O.Max Gardner Birthplace | * Roodale Mill |
| * Gardner-Webb College | |

These properties will not be affected by the projects proposed on the thoroughfare plan. However, care should be taken to make certain that all historic sites and natural settings are preserved. Therefore, a closer study should be done to the local historic sites prior to the construction of any of the proposed improvements.

Environmental Data



- ⊕ Hazardous Waste Facilities (Statewide)
- ✕ Transportation Improvement Project pts
- ★ Historic Structures/Districts (Statewide Point)

County Names

County Boundary (Statewide 100k)

County Boundary

State Boundary

Shore Line

⊕ Water Supply Intakes (Statewide)

National Wetland Inventory (Eastern)

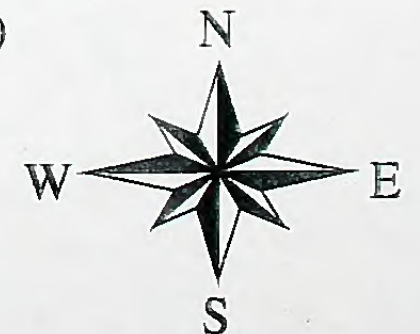
- E1 Estuarine
- E2 Estuarine
- L1 Lacustrine
- L2 Lacustrine
- M1 Marine
- M2 Marine
- P Palustrine
- P- Palustrine
- R1 Riverine
- R2 Riverine
- R3 Riverine
- R4 Riverine
- R5 Riverine
- U URBAN
- Z OTHER

National Wetland Inventory (Eastern)

- E1 Estuarine
- E2 Estuarine
- L1 Lacustrine
- L2 Lacustrine
- M1 Marine
- M2 Marine
- P Palustrine
- R1 Riverine
- R2 Riverine
- R3 Riverine
- R4 Riverine
- R5 Riverine
- U URBAN

Municipal Boundaries (Statewide)

■ Municipal Boundaries



13 0 13 26 Miles

Figure 7

Chapter 7

County Thoroughfare Planning Principles

Purpose of Planning

There are many benefits to be gained from thoroughfare planning, but the primary objective is to assure that a road system will be progressively developed that will adequately serve future travel desires. Thus, the cardinal concept of thoroughfare planning is to make provisions for street and highway improvements so that when needs arise, feasible opportunities to make improvements exist.

The major benefits derived from thoroughfare planning are:

- (1) Each road or highway can be designed to perform a specific function and to provide a specific level of service. This permits savings in right-of-way, construction, and maintenance costs; protects residential neighborhoods, and encourages stability in travel and land use patterns.
- (2) Local officials are informed of future improvements. Developers can design subdivisions to function in a non- conflicting manner. School and park officials can better locate their facilities. Damage to property values and community appearance that is sometimes associated with road improvements can be minimized.

County Thoroughfare Planning Concepts

The underlying concept of the thoroughfare plan is that it provides a functional system of streets, roads and highways that permit travel from origins to destinations with ease, safety and a direct travel path. Different elements in the system are designed and called on to perform specific functions and levels of service, thus minimizing the traffic and land service conflict.

Within the County plan, elements are considered either urban or rural. In the urban planning area, the local municipality generally has planning jurisdiction. Outside the urban planning area, the County has planning jurisdiction. In those urban areas where no urban thoroughfare plan has been developed, elements are generally considered rural and under the planning jurisdiction of the County. When a thoroughfare plan is developed for an urban area that has not previously had a plan, then the area defined by that plan would be considered urban and come under the jurisdiction of the municipality.

Within the urban and rural systems, thoroughfare plan elements are classified according to the specific function that they are to perform. A discussion of the elements and functions of the two systems follows.

Thoroughfare Classification Systems

Streets perform two primary functions, traffic service and land access, which when combined, are basically incompatible. The conflict is not serious if both traffic and land service demands are low. However, when traffic volumes are high, conflicts created by uncontrolled and intensely developed abutting property lead to intolerable traffic flow friction and congestion.

The underlying concept of the thoroughfare plan is that it provides a functional system of streets that permit travel from origins and destinations with directness, ease and safety. Different streets in this system are designed and called on to perform specific functions, thus minimizing the traffic and land service conflict.

Urban Classification

In the urban thoroughfare plan, elements are classified as major thoroughfares, minor thoroughfares, or local access streets.

Major Thoroughfares are the primary traffic arteries of the urban area providing for traffic movements within, around, and through the area.

Minor Thoroughfares collect traffic from the local access streets and carry it to the major thoroughfare system.

Local access streets have the primary purpose of providing access to abutting property. This classification may be further classified as either residential, commercial, and/or industrial depending upon the type of land use that they serve.

Due to the limited amount of detail that can be shown on a county thoroughfare plan, only urban major thoroughfares are shown.

Rural Classification

The facilities outside the urban thoroughfare planning boundaries make up the rural system. These are four major systems: principal arterials, minor arterials, major and minor collectors, and local roads.

Rural Principal Arterial System

This system is a connected network of continuous routes that serve corridor movements having substantial statewide or interstate travel characteristics. This will be shown by both the trip lengths and the travel densities. The principal arterial system should serve all urban areas of over 50,000 population and a majority of those with a population greater than 5000. The Interstate System constitutes a significant portion of the principal arterial system.

Rural Minor Arterial System

This system in conjunction with the principal arterial system forms a network that links cities, larger towns, and other major traffic generators such as large resorts. The minor arterial system generally serves interstate and intercounty travel and serves travel corridors with trip lengths and travel densities somewhat less than the principal arterial system.

Rural Collector Road System

The rural collector routes generally serve intracounty travel rather than statewide travel and constitutes those routes on which the predominant travel distances are shorter than on the arterial routes. This system is subclassified into major collector roads and minor collector roads.

Major Collector Roads

These routes provide service to the larger municipalities not directly served by the higher systems and to other traffic generators of equivalent intracounty importance, such as schools, shipping points, parks, and other important areas. Major Collector Roads also link these places with nearby larger towns or cities, or with routes of higher classification and serve the more important intracounty travel corridors.

Minor Collector Roads

These routes collect traffic from local roads and bring all developed areas within a reasonable distance of a collector road. They also provide service to the remaining smaller communities and link the locally important traffic generators with the rural outskirts.

Rural Local Road System

The local roads comprise all roads not on one of the higher systems. Local residential subdivision streets and residential collector streets are elements of the local road system. Local residential streets are either cul-de-sacs, loop streets less than 762.2 m (2,500 ft) in length, or streets less than 1.6 km (1.0 mi) in length that do not connect thoroughfares or serve major traffic generators and do not collect traffic from more than one hundred dwelling units. Residential collector streets are streets that serve as the connecting street system between local residential streets and the thoroughfare system.

Figure 8 shows the functional classification of the major roads in Cleveland County. Figure 9 provides a schematic of a functionally classified rural highway system.

Objectives of Thoroughfare Planning

Thoroughfare planning is the process public officials use to assure the development of the most appropriate street system to meet the existing and future travel desires within the urban area. The primary aim of a thoroughfare plan is to guide the development of the street system in a matter

consistent with changing traffic demands. Through proper planning for street development, costly errors and needless expense can be averted. A thoroughfare plan will enable street improvements to be made as traffic demand increases, and help eliminate unnecessary improvements. By developing the street system to keep pace with increasing traffic demands, a maximum utilization of the system can be attained that will require a minimum amount of land for street purposes. In addition to providing for traffic needs, the thoroughfare plan should embody those details of good urban planning necessary to present a pleasing and efficient urban community. The location of present and future population, commercial and industrial enterprises, affects major street and highway locations. Conversely, the location of major streets and highways within the urban area will influence the urban development pattern.

Other objectives of a thoroughfare plan include:

- To provide for the development of an adequate major street system as land development occurs;
- To reduce travel and transportation costs;
- To reduce the cost of major street improvements to the public through the coordination of street system with private action;
- To enable private interests to plan their actions, improvements, and development with full knowledge of public intent;
- To minimize disruption and displacement of people and business through long range planning for major street improvements;
- To reduce environmental impacts such as air pollution, resulting from transportation; and
- To increase travel safety.

These objectives are achieved through improving both the operational efficiency of thoroughfares, and improving the system efficiency by system coordination and layout.

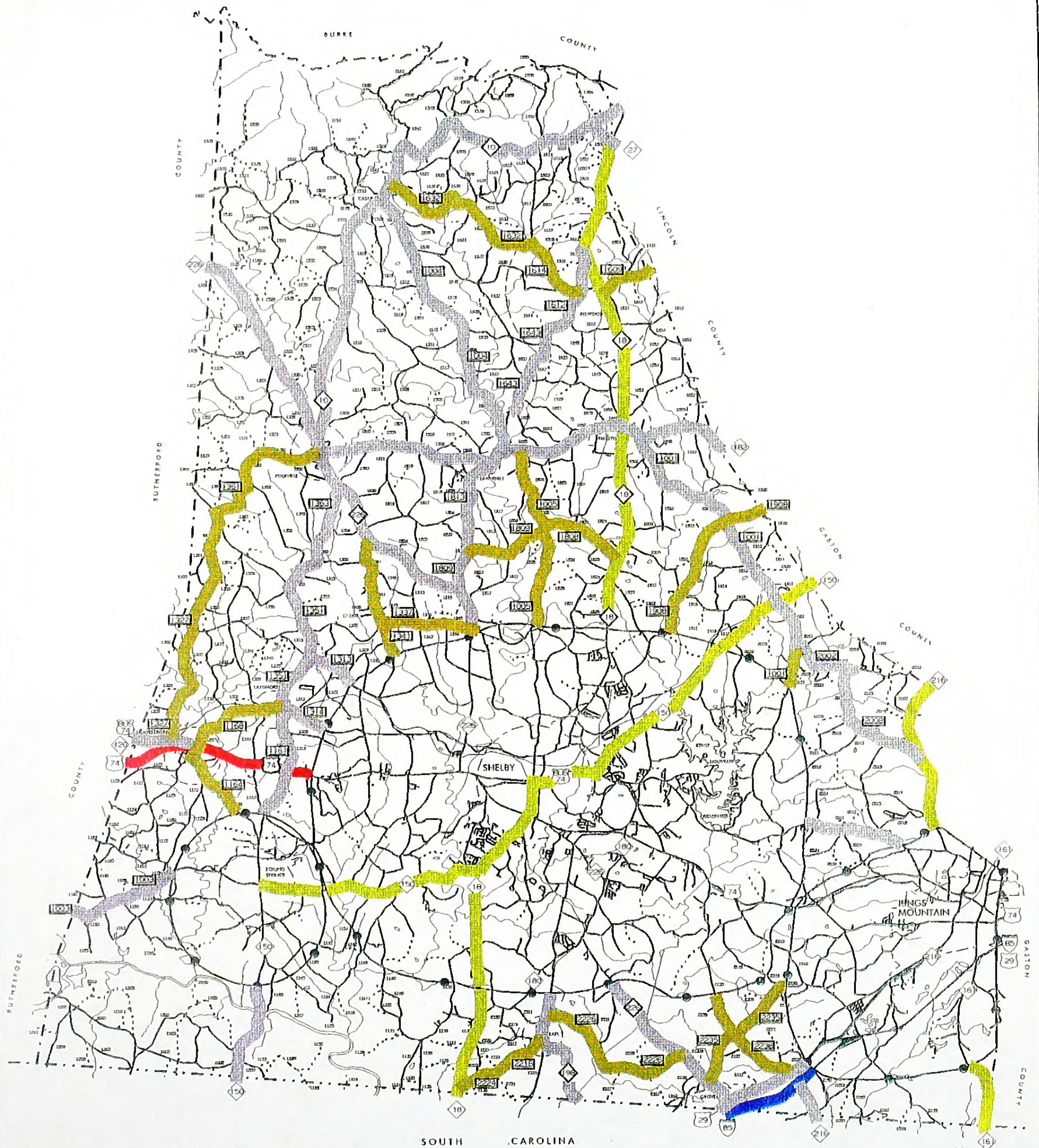
Operational Efficiency

The operational efficiency of a street is improved by increasing the capability of the street to carry vehicular traffic and people. In terms of vehicular traffic, the capacity of a street is the maximum number of vehicles that can pass a given point on a roadway during a given period under prevailing roadway and traffic conditions. Capacity is affected by the physical features of the roadway, nature of traffic, and weather.

Physical ways to improve vehicular capacity include:

Street widening - widening a street from two to four travel lanes, the capacity of the roadway more than doubles because additional maneuverability for the traffic has been provided.

Intersection improvements - increasing the turning radii, adding exclusive turn lanes, and channelizing movements can improve the capacity of an existing intersection.



CLEVELAND COUNTY

NORTH CAROLINA

PREPARED BY
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-GIS UNIT
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION



FUNCTIONAL CLASSIFICATION

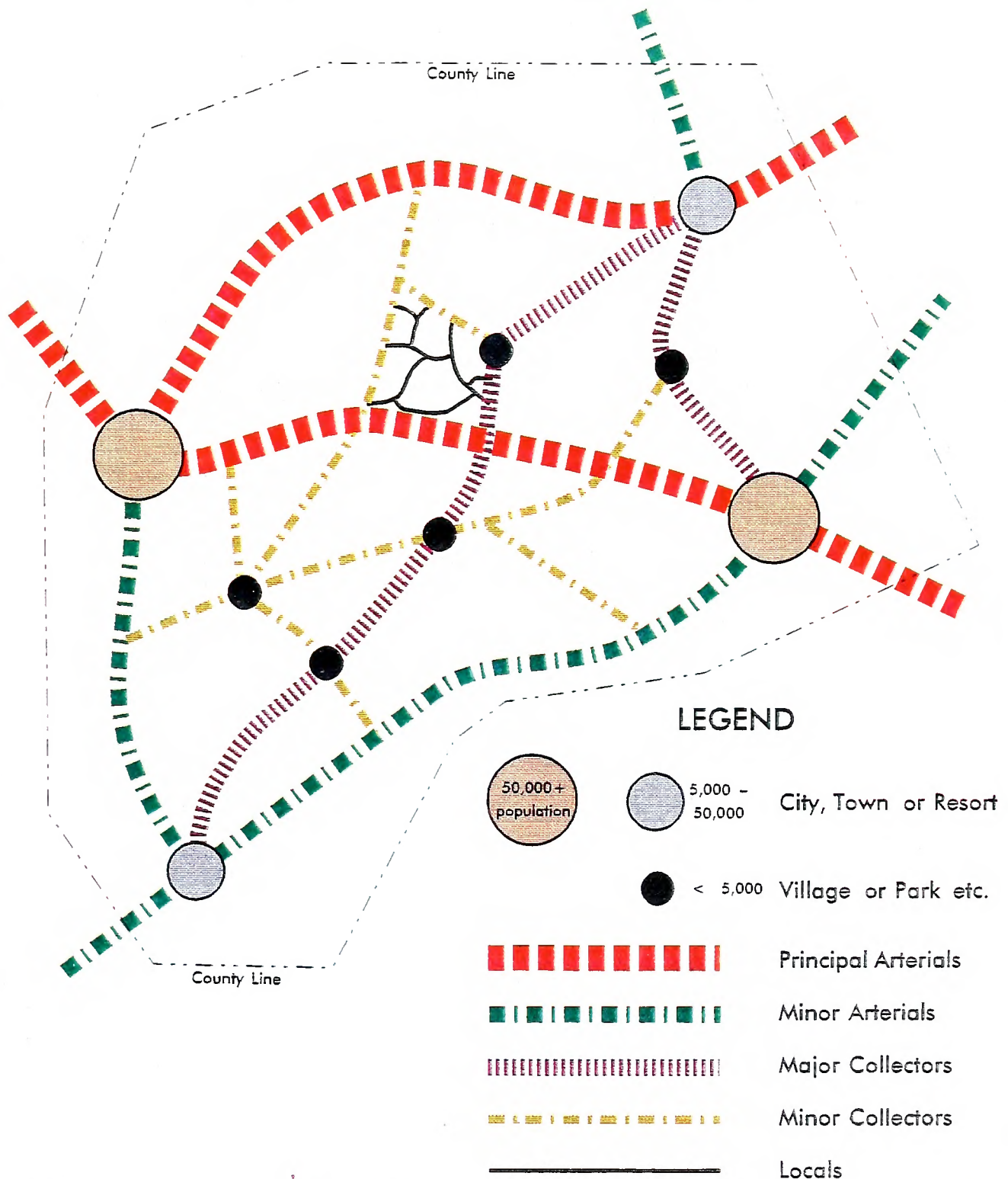
LEGEND

INTERSTATE	
OTHER FEDERAL ARTERIAL	
MAJOR ARTERIAL	
MAJOR COLLECTOR	
MINOR COLLECTOR	
URBAN FEEDING AREA	

FIGURE B

RURAL HIGHWAY NETWORK FUNCTIONAL CLASSIFICATION

Figure 9



Improving vertical and horizontal alignment - reduces the congestion caused by slow moving vehicles.

Eliminating roadside obstacles - reduces side friction and improves a driver's field of sight.

Operational ways to improve street capacity include:

Control of access - a roadway with complete access control can often carry three times the traffic handled by a non-controlled access street with identical lane width and number of lanes.

Parking removal - increases capacity by providing additional street width for traffic flow and reducing friction to flow caused by parking and unparking vehicles.

One-way operation - the capacity of a street can sometimes be increased 20-50%, depending upon turning movements and street width, by initiating one-way traffic operations. One-way streets also can improve traffic flow by decreasing potential traffic conflicts and simplifying traffic signal coordination.

Reversible lanes - reversible traffic lanes may be used to increase street capacity in situations where heavy directional flows occur at peak periods.

Signal phasing and coordination - uncoordinated signals and poor signal phasing restrict traffic flow by creating excessive stop-and-go operation.

Altering travel demand is a third way to improve the efficiency of existing streets. Travel demand can be reduced or altered in the following ways:

Carpools - encourage people to form carpools and vanpools for journeys to work and other trip purposes; this reduces the number of vehicles on the roadways and raises the people carrying capability of the street system.

Alternate mode - encourage the use of alternate modes of travel such as transit, bicycles, or walking for short distance trips.

Work hours - encourage industries, business, and institutions to stagger work hours or establish variable work for employees; this will reduce travel demand in peak periods and spread peak travel over a longer period.

System Efficiency


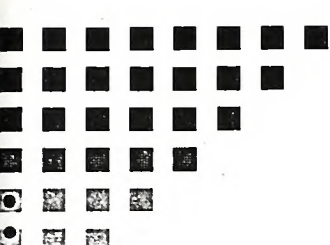
Another means of altering travel demand is the development of a more efficient system of streets that will better serve travel desires. A more efficient system can reduce travel distances, time, and cost. Improvements in system efficiency can be achieved through the concept of functional classification of streets and development of a coordinated major street system.

Application of Thoroughfare Planning Principles


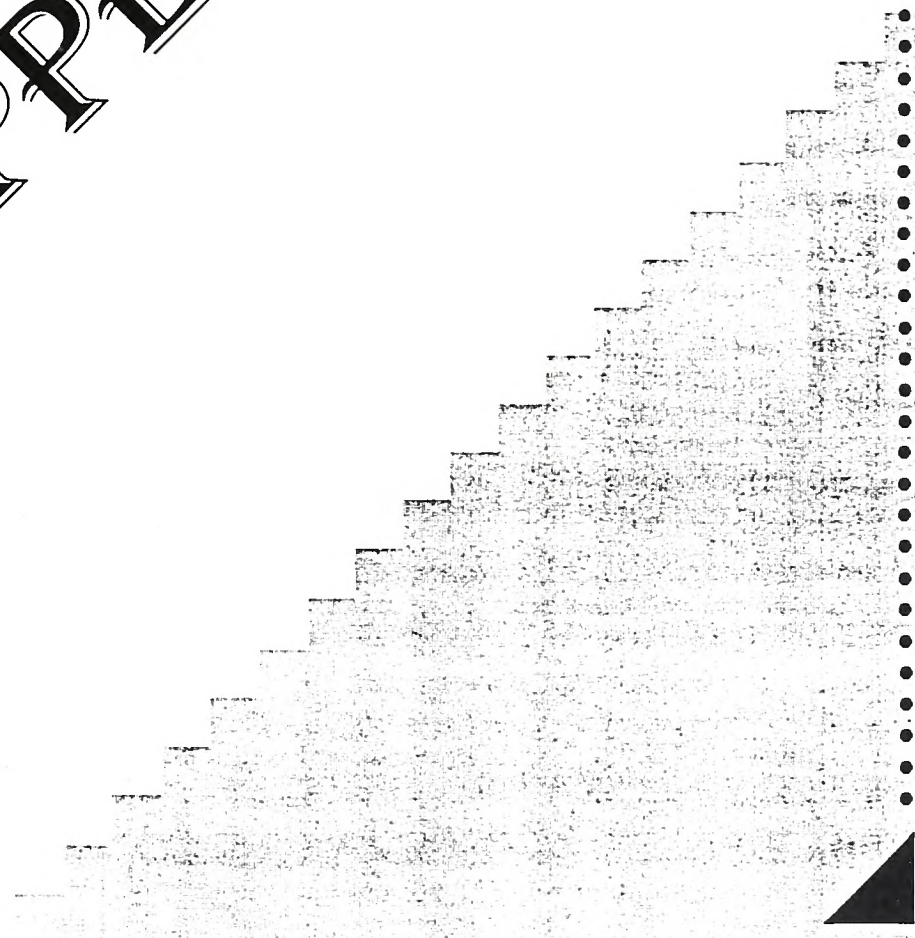
The concepts presented in the discussion of operational efficiency, system efficiency, functional classification, and idealized major thoroughfare system are the conceptual tools available to the transportation planner in developing a thoroughfare plan. In actual practice, thoroughfare planning is done for established urban areas and is constrained by existing land use and street patterns, existing public attitudes and goals, and current expectations of future land use. Compromises must be made because of these and the many other factors that affect major street locations.

Through the thoroughfare planning process it is necessary from a practical viewpoint that certain basic principles be followed as closely as possible. These principles are listed below:

1. The plan should be derived from a thorough knowledge of today's travel - its component parts, and the factors that contribute to it, limit it, and modify it.
2. Traffic demands must be sufficient to warrant the designation and development of each major street. The thoroughfare plan should be designed to accommodate a large portion of major traffic movements on a few streets.
3. The plan should conform to and provide for the land development plan for the area.
4. Certain considerations must be given to urban development beyond the current planning period. Particularly in outlying or sparsely developed areas that have development potential, it is necessary to designate thoroughfares on a long range planning basis to protect right-of-way for future thoroughfare development.
5. While being consistent with the above principles and realistic in terms of travel trends, the plan must be economically feasible.



APPENDICES



Appendix A

Thoroughfare Plan Street Tabulation and Recommendations

This appendix includes a detailed tabulation of all the streets identified as elements of the Cleveland County Thoroughfare Plan. The table includes a description of each section, as well as the length, cross section, and right of way for each section. Also included are existing and projected average daily traffic volumes, roadway capacity, and the recommended ultimate lane configuration. Due to space constraints, these recommendations are given in the form of an alphabetic code. A detailed description of each of these alpha-codes and an illustrative figure for each can be found in Appendix C.

The following index of terms may be helpful in interpreting the table:

PB - Planning Boundary

CL - Corporate Limits

SR - State Road

ADQ - Adequate

N - North

S - South

E - East

W - West

' - Foot

REN - Rename

Appendix A
Thoroughfare Plan Street Tabulation and Recommendations

FACILITY & SECTION	EXISTING CROSS-SECTION							PRACTICAL CAPACITY CURRENT (FUTURE)	1994 ADTS	2020 ADTS	RECOMMENDED X - SECTION	
	S.I. UNITS			ENGLISH UNITS			NUMBER of LANES				RDWAY (ULT)	ROW ULT
	DIST km	RDWY m	ROW m	DIST MI	RDY FT	ROW FT						
NC 10												
NCL Polkville-SCL Casar	.70	6.10	30.49	.44	20	100	2	4,800	1,800	3,300	K	ADQ
SCL Casar-SR 1538	4.19	6.10	30.49	5.77	20	100	2	4,800	1,800	3,300	K	ADQ
SR 1538-SR 1542	.421	6.10	30.49	0.26	20	100	2	4,800	2,900	4,800	K	ADQ
SR 1542-NCL Casar	1.56	10.97	30.49	0.97	36	100	2	4,800	2,900	4,800	K	ADQ
NCL Casar-NC 27	.66	6.10	30.49	0.41	20	100	2	4,800	1,400	2,600	K	ADQ
NC 27-Lincoln Co	11.25	6.10	30.49	6.99	20	100	2	4,800	1,400	2,600	K	ADQ
NC 18												
NC 180-SR 1113	9.49	7.32	18.29	5.90	24	60	2	8,000	4,700	7,700	G	70
SR 1113-SCL Shelby	1.75	11.58	18.29	1.09	38	60	2	10,500	4,900	9,000	G	70
NCL Shelby-NC 180	4.05	15.85	24.39	2.53	52	80	4	18,000	7,463	12,500	ADQ	ADQ
NC 180-SCL Fallston	1.61	19.51	24.39	1.00	64	80	4	18,000	12,000	12,500	ADQ	ADQ
SCL Fallston-NC 182	8.97	12.20	18.29	5.57	40	60	2	11,000	6,900	16,300	G	70
NC 182-NCL Fallston	0.50	12.20	18.29	0.47	40	60	2	11,000	3,300	6,500	G	70
NCL Fallston-Lincoln Co	11.01	12.20	30.49	6.68	24	60	2	9,500	3,300	6,500	F	110
NC 150												
SC Line-SCL Boiling S.	3.55	6.09	18.29	4.59	20	60	2	4,800	1,500	2,800	K	70
SR 1003-ECL Boiling S.	1.56	7.31	18.29	0.97	36	60	2	9,600	3,000	7,900	G	70
ECL Boiling S.-NC 180	19.59	12.50	18.29	12.17	24	60	2	8,000	3,800	7,900	G	70
NC 180-Gaston Co.	10.01	12.52	18.29	6.22	24	60	2	8,000	8,800	15,400	G	70
NC 180												
NC 198-NC 226	5.81	6.09	18.29	3.61	20	60	2	4,800	5,300	9,800	G	70
NC 226-US 74 Bus	6.95	6.09	18.29	4.32	20	60	2	4,800	12,390	17,000	See Shelby TP	
US 74 Bus-SR 2087	0.80	10.97	18.29	0.50	36	60	2	9,000	14,600	17,000	See Shelby TP	
SR 2087-NC 150	3.14	12.52	18.29	1.95	24	60	2	8,000	12,500	17,000	See Shelby TP	
NC 150-NC 18	3.88	6.09	18.29	2.41	20	60	2	6,500	8,500	9,500	See Shelby TP	
NC 182												
ECL Polkve-Forney St.	6.87	12.52	18.29	4.27	24	60	2	9,000	2,300	4,300	ADQ	ADQ
Forney St.-Bridge	0.80	9.75	18.29	0.50	32	60	2	8,000	2,300	4,300	ADQ	ADQ
Bridge-WCL Fallston	4.78	12.52	18.29	2.97	24	60	2	9,000	1,600	3,100	ADQ	ADQ
WCL Fallston-ECL Falls.	5.77	14.63	18.29	3.59	36	60	2	9,000	1,600	3,100	ADQ	ADQ
ECL Fallston-Lincoln Co	3.63	5.55	18.29	2.26	18	60	2	4,500	1,600	3,100	K	ADQ
US 74												
I85 to Western PB	See Kings Mountain Thoroughfare Plan											
Dixon Blvd in Shelby	3.97	14.63	48.78	2.46	48	160	4	22,000	NA	40,500	Shelby Plan	
PB - PLANNING BOUNDARY CL - CORPORATE LIMITS SR - STATE ROAD N - NORTH S - SOUTH E - EAST W - WEST												

Appendix A
Thoroughfare Plan Street Tabulation and Recommendations

FACILITY & SECTION	EXISTING CROSS-SECTION							PRACTICAL CAPACITY CURRENT (FUTURE)	1994 ADTS	2020 ADTS	RECOMMENDED X - SECTION	
	S.I. UNITS			ENGLISH UNITS			NUMBER of LANES				RDWAY (ULT)	ROW (ULT)
	DIST km	RDWY m	ROW m	DIST MI	RDY FT	ROW FT						
NC 198												
South Carolina-NCL Earl	4.04	6.17	30.49	2.51	20	60	2	4,500	3,300	6,000	K	70
NCL Earl-NC 180	0.48	14.81	30.49	0.30	48	60	4	13,500	3,254	6,500	K	70
NC 216												
South Carolina - I-85	1.27	5.55	18.29	0.79	18	60	2	3,200	806	1,500	Kings Mt. PB	
I-85 - US 29	0.32	7.32	18.29	0.20	24	60	2	8,000	806	1,500	Kings Mt. PB	
US 29 - Kings Mt. UB	2.46	6.77	18.29	1.53	22	60	2	6,400	806	1,500	Kings Mt. PB	
Kings Mt. UB - SR 2008	2.22	7.32	18.29	1.38	24	60	2	8,000	4,771	6,000	ADQ	70
SR 2008 - Gaston Co.	3.07	5.53	18.29	1.91	18	60	2	3,200	4,771	6,000	K	70
NC 226												
US 29 - Laurel St.	0.03	9.15	18.29	0.02	30	60	2	8,500	3,000	5,000	ADQ	70
Laurel St.- Mulberry Rd.	0.63	7.37	18.29	0.14	24	60	2	8,500	3,000	5,000	ADQ	70
Mulberry Rd.- WCL Grover	0.39	6.17	18.29	0.24	20	60	2	4,500	3,000	5,000	K	70
WCL Grover - SCL Patter	4.30	6.46	18.29	2.67	21	60	2	4,500	3,000	5,000	K	70
SCL Patter - NC 180	3.30	6.17	18.29	2.05	20	60	2	4,500	3,000	5,000	K	70
SR 1001												
SCL Waco - SR 2001	.16	5.53	0	.10	18	0	2	3,200	2,000	3,500	K	70
SR 2001 - SR 2159	1.53	5.53	0	.95	18	0	2	3,200	1,800	3,500	K	70
SR 1003												
WCL Boilng - Ruthrfd Co	3.54	7.32	16.92	2.20	20	55	2	4,500	1,800	3000	K	70
SR 1004												
NC 10 - NC 182	11.94	7.32	16.92	7.42	20	55	2	4,500	1,000	2,000	K	70
SR 1363												
SR 1350 - NC 182	3.70	5.53	16.92	2.30	18	55	2	3,200	683	1,000	ADQ	ADQ
SR 1351												
Ruthrfd Co. - SR 1350	7.02	7.53	16.92	4.36	20	55	2	3,200	634	1,000	ADQ	ADQ
SR 1350 - SR 1323	1.99	7.53	16.92	1.24	20	55	2	3,200	914	12,50	ADQ	ADQ
SR 1612												
ECL Belwd - NC 18	6.10	5.53	10.78	3.79	18	35	2	3,200	291	660	ADQ	ADQ
PB - PLANNING BOUNDARY CL - CORPORATE LIMITS SR - STATE ROAD N - NORTH S - SOUTH E - EAST W - WEST ADQ - ADEQUATE												

Appendix A

Thoroughfare Plan Street Tabulation and Recommendations

PB - SOUTH PLANNING BOUNDARY CL - CORPORATE LIMITS SR - STATE ROAD ADQ - ADEQUATE
N - NORTH S - SOUTH E - EAST W - WEST

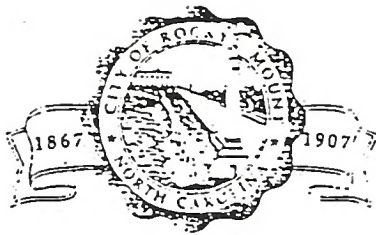
Appendix B

Process for Placement of a Project in the Transportation Improvement Program

The process for attempting to get a project into the TIP is described briefly in this appendix.

The local planning board should first decide on which projects they would like funded and placed in the TIP book. They should not try and attempt to get all of the improvements recommended in the thoroughfare plan into the TIP but select carefully a few of the projects that would provide the greatest impact on the traffic network in the area. These projects should be prioritized by the planning board and summarized briefly, as shown on Appendix Page B-2.

After determining which projects are needed in the area then an official letter for the TIP Project Request should be written to the N.C. Board of Transportation member from the municipality's respective district. Along with the letter, should be the prioritized summary of proposed projects for funding, a TIP Candidate Project Request Form for every project that is to be considered for funding and inclusion in the TIP, and a map that describes the location of each project that is being proposed for funding. An example of each one of these items is included in this appendix on the pages that follow.



CITY OF ROCKY MOUNT

OFFICE OF
THE CITY MANAGER

November 14, 1994

Mr. Clark Jenkins, Member
N.C. Board of Transportation
N.C. Department of Transportation
P.O. Box 25201
Raleigh, NC 27611-5201

RE: 1996-2002 TIP Project Requests
Rocky Mount Metropolitan Area

Dear Mr. Jenkins:

Enclosed find the projects requested by the Rocky Mount Metropolitan Area for consideration in the next TIP update. The list is presented by priority, as approved by the Rocky Mount Area Transportation Advisory Committee (TAC) on November 9, 1994.

The Transportation Advisory Committee also endorsed the existing schedule of projects contained in the current TIP for the Rocky Mount urban area, with one request. The TAC requests that TIP Project #U-2310 specifically include intersection improvements on the north side of the intersection of NC 97 (Raleigh Road) and Nashville Road. This intersection is very restricted and the TAC wants to ensure that improvements are considered as part of the widening project.

We thank you for the opportunity to participate in development of the state TIP. Please contact us immediately if additional information is needed concerning any of the enclosed project requests.

Sincerely,

Peter F. Varney
Assistant City Manager

Enclosure

B-2

ROCKY MOUNT METROPOLITAN AREA
TRANSPORTATION ADVISORY COMMITTEE

1994 PROPOSED HIGHWAY PROJECTS (FINAL)

US 301 Bypass from Benvenue Road to May Drive	NASH
- on 1995-2001 TIP for feasibility (#U-3330)	
- Request project funding & schedule, and request extension of project to north of Tiffany Blvd. intersection	
Abbott Labs Road and SR 1400 improvements	EDGECOMBE
- on 1995-2001 TIP for feasibility (#U-3329)	& NASH
- Request project funding and schedule	
Country Club Road from Jeffreys to US 64	NASH
- ON 1995-2001 TIP for feasibility (#U-3331)	
- Request project funding and schedule	
Hunter Hill Road from Country Club Road to NC 43	NASH
- Major thoroughfare approaching capacity	
- Request widening to accommodate present & future traffic	
Outer Loop: Southern Connector	EDGECOMBE
- Request feasibility study to determine the best location for rail, river & highway crossings required to connect sections of the outer loop	& NASH
Halifax Road from Sunset to Bethlehem Road	NASH
- On 1995-2001 TIP for feasibility (#U-3316)	
- Request project funding and schedule	
Outer Loop: US 301 to Old Battleboro Road	EDGECOMBE
- Widen to accommodate traffic	
- Possible realignment east of US 301 to eliminate offset at Fountain Correctional Center	
Jeffreys Road from Benvenue Road to US 301 Bypass	NASH
- Widen to accommodate traffic	
- Minor thoroughfare approaching capacity on segment between Fenner Road and US 301 Bypass	
Nashville Road/Bridge over Tar River	NASH
- Stacking space insufficient for southbound traffic turning left onto Hammond Street	
- Major thoroughfare	
Bethlehem Road from Beechwood Drive to Halifax Rd	NASH
- Widen to accommodate future traffic from continuing development in this area and west of Halifax Road	
- Thoroughfare plan designates as major thoroughfare	

HIGHWAY PROGRAM
TIP CANDIDATE PROJECT REQUEST

(PLEASE PROVIDE INFORMATION IF AVAILABLE)

MPO Rocky Mount 2. DATE 11-14-94 3. PRIORITY NO. 1

ROUTE (US, NC, SR/Local Name) US 301 Bypass

PROJECT LOCATION (From/To/Length) NC 43/48 (Benvenue Rd) to
Tiffany Boulevard (length revised from #u-3330 feasibility
to include intersection at Tiffany Boulevard)

TYPE OF PROJECT (Widening, New Facility, Resurfacing,
Bridge Replacement, Signing, Safety, Rail Crossing, etc.)

Widening

EXISTING CROSS SECTION _____ FEET, TYPE _____

EXISTING ROW _____ FEET 9. EXISTING ADT 29,386 (1992)

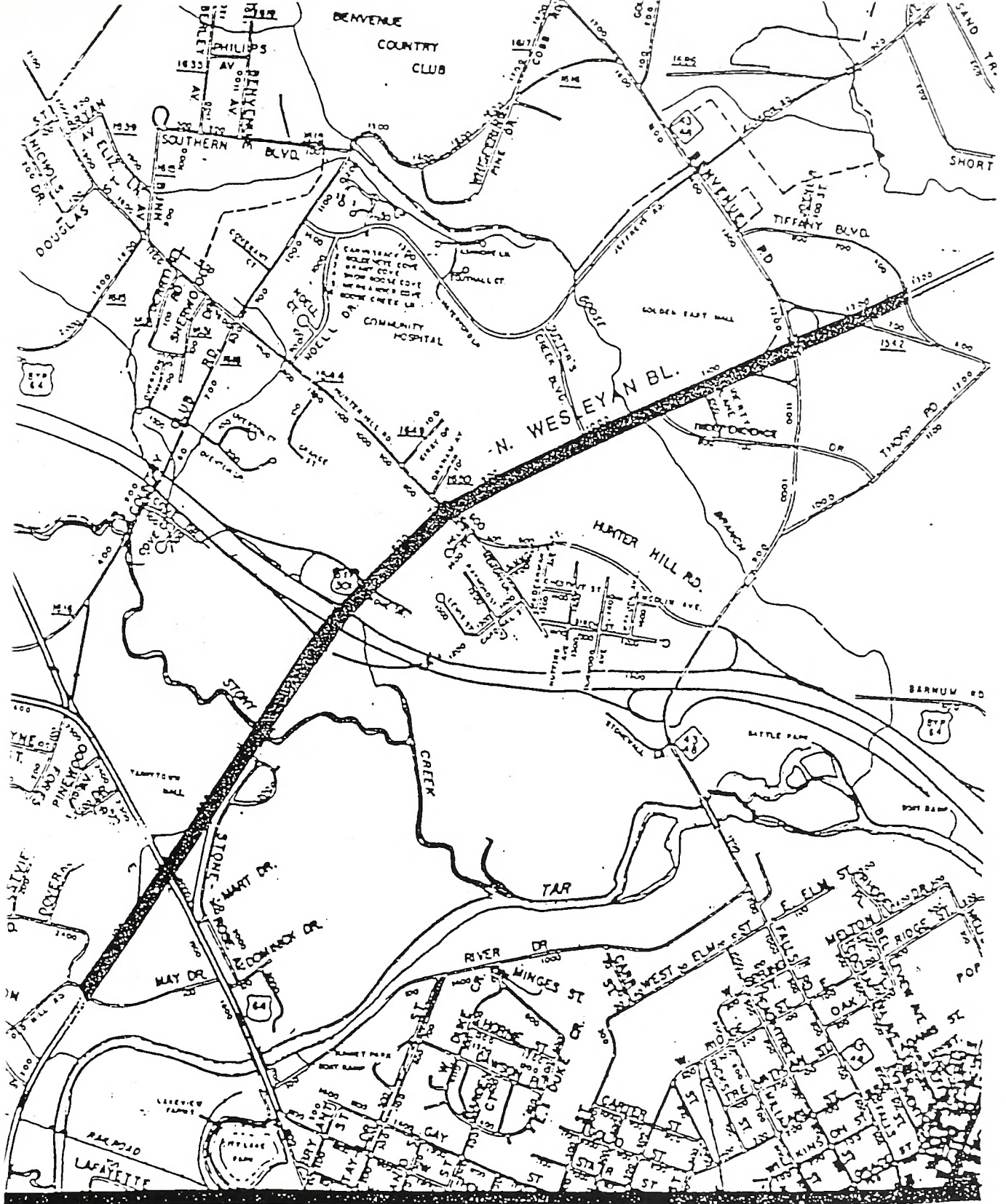
ESTIMATED COST, ROW \$ _____ CONSTRUCTION \$ _____

BRIEF JUSTIFICATION FOR PROJECT Major thoroughfare
carrying increasing traffic from large commercial
developments within this corridor and north-south through
traffic. MPO requests funding & scheduling based on feasibility
study results.

PROJECT SUPPORTED BY (Agency/Group) _____

ROCKY MOUNT AREA TRANSPORTATION ADVISORY COMMITTEE

PLEASE ATTACH MAP SHOWING PROJECT LOCATION



#1 US 301 BYPASS

Benvenue Rd (NC43/48) to May Drive

Appendix C

TYPICAL THOROUGHFARE CROSS SECTIONS

Cross section requirements for thoroughfares vary according to the desired capacity and level of service to be provided. Universal standards in the design of thoroughfares are not practical. Each street section must be individually analyzed and its cross section requirements determined on the basis of amount and type of projected traffic, existing capacity, desired level of service, and available right-of-way.

Typical cross section recommendations are shown in Figure C-1. These cross sections are typical for facilities on new location and where right-of-way constraints are not critical. For widening projects and urban projects with limited right-of-way, special cross sections should be developed that meet the needs of the project.

Recommended typical cross sections for thoroughfares were derived on the basis of projected traffic, existing capacities, desirable levels of service, and available right-of-way. The recommended typical cross sections for the thoroughfares are given in Appendix A along with other pertinent information.

On all existing and proposed major thoroughfares delineated on the thoroughfare plan, adequate right-of-way should be protected or acquired for the ultimate cross sections. Ultimate desirable cross sections for each thoroughfare are listed in Appendix A. Recommendations for "ultimate" cross sections are provided for the following:

- (1) thoroughfares which may require widening after the current planning period
- (2) thoroughfares which are borderline adequate and accelerated traffic growth could render them deficient
- (3) thoroughfares where an urban curb and gutter cross section may be locally desirable because of urban development or redevelopment.

Recommended design standards relating to maximum and minimum grades, minimum sight distances, maximum degree of curve and related super elevation, and other considerations for thoroughfares are given in Appendix D. This Appendix gives definitions and design standards recommended for inclusion in subdivision regulations.

A - Four Lanes Divided with Median - Freeway

Cross section "A" is typical for controlled access freeways. The 14 m (46') grassed median is the minimum desirable median width, but there could be some variation from this depending upon design considerations. Right-of-way requirements would typically vary upward from 70 m (228') depending upon cut and fill requirements.

B - Seven Lanes - Curb and Gutter

Cross section "B" should not be used for new projects. When the conditions warrant six lanes, cross section "D" should be recommended. Cross section "B" should be used only in special situations such as when widening from a five lane section and right-of-way is limited. Even in these situations, consideration should be given to converting the center turn lane to a median so that cross section "D" is the final cross section.

C - Five Lanes - Curb and Gutter

Cross section "C" is typical for major thoroughfares where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

D - Six Lanes Divided with Raised Median - Curb and Gutter

E - Four Lanes Divided with Raised Median - Curb and Gutter

Cross sections "D" and "E" are used on major thoroughfares where left turns and intersecting streets are not as frequent. Left turns would be restricted to a few selected intersections. The 4.8 m (16') median is the minimum recommended for an urban boulevard type cross section. In most instances, monolithic construction should be utilized due to greater cost effectiveness, ease and speed of placement, and reduced future maintenance requirements. In special cases, grassed or landscaped medians may be used in urban areas. However, these types of medians result in greatly increased maintenance costs and an increased danger to maintenance personnel. Non-monolithic medians should only be recommended when the above concerns are addressed.

F - Four Lanes Divided - Boulevard, Grass Median

Cross section "F" is recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 7.3 m (24') is recommended with 9.1 m (30') being desirable.

G - Four Lanes - Curb and Gutter

Typical cross section "G" is recommended for major thoroughfares where projected travel indicates a need for four travel lanes but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane would probably be required at major intersections. This cross section should be used only if the above criteria is met. If right-of-way is not restricted, future strip development could take place and the inner lanes could become de facto left turn lanes.

H - Three Lanes - Curb and Gutter

In urban environments, thoroughfares which are proposed to function as one-way traffic carriers would typically require cross section "H". Cross sections "I" and "J" are usually recommended for urban minor thoroughfares since these facilities usually serve both land service and traffic service functions. Cross section "J" would be used on those minor thoroughfares where parking on both sides is needed as a result of more intense development.

I - Two Lanes - Curb and Gutter, Parking Both Sides

J - Two Lanes - Curb and Gutter, Parking One Side

Cross Sections "I" and "J" are usually recommended for urban minor thoroughfares since these facilities usually serve both land service and traffic service functions. Cross Section "I" would be used on those minor thoroughfares where parking on both sides is needed as a result of more intense development.

K - Two Lanes - Paved Shoulder

This cross section is used in rural areas or for staged construction of a wider multi-lane cross section. On some thoroughfares, projected traffic volumes may indicate that two travel lanes will adequately serve travel for a considerable period of time. For area that are growing and future widening will be necessary, the full right-of-way of 30 m (100 ft) should be required. In some instances, local ordinances may not allow the full 30 m. In those cases, 21 m (70 ft) should be preserved by use of building setbacks and future street line ordinances.

L - Six Lanes Divided with Grass Median - Freeway

Cross Section "L" is typical for controlled access freeways. The 14 m (46 ft) grassed median is the minimum desirable median width, but there could be some variation from this depending upon design considerations. Right-of-way requirements would typically vary upward from 70 m (228 ft) depending on cut and fill requirements.

M - Eight Lanes Divided with Raised Median - Curb and Gutter

Also used for controlled access freeways, this cross sections may be recommended for freeways going through major urban areas or for routes projected to carry very high volumes of traffic.

N - Five Lane Roadway - Curb and Gutter, Widened Curb Lanes

O - Two Lanes - Shoulder Section

P - Four Lanes Divided with Raised Median - Curb and Gutter, Widened Curb Lanes

If there is sufficient bicycle travel along the thoroughfare to justify a bicycle lane or bikeway, additional right-of-way may be required to contain the bicycle facilities. The North Carolina Bicycle Facilities Planning and Design Guidelines should be consulted for design standards for bicycle facilities. Cross Sections "N", "O", and "P" are typically used to accommodate bicycle travel.

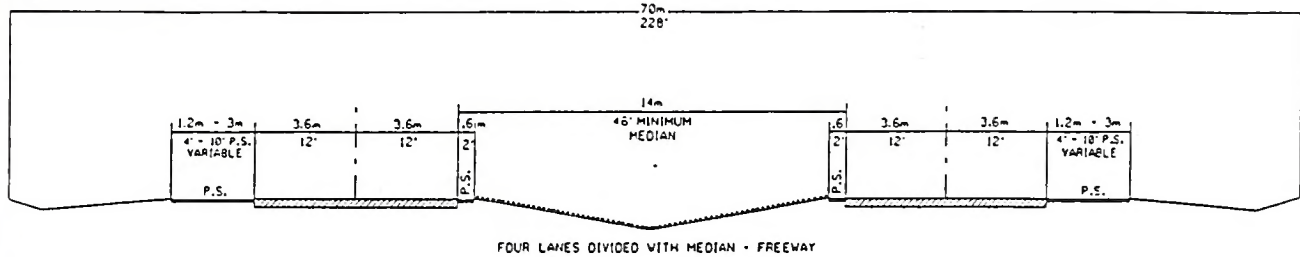
General

The urban curb and gutter cross sections all illustrate the sidewalk adjacent to the curb with a buffer or utility strip between the sidewalk and the minimum right-of-way line. This permits adequate setback for utility poles. If it is desired to move the sidewalk farther away from the street to provide additional separation for pedestrians or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback for utility poles.

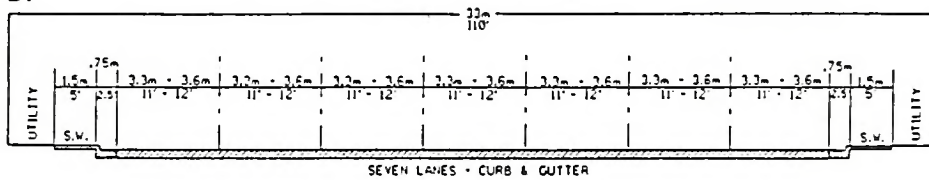
The right-of-ways shown for the typical cross sections are the minimum rights-of-way required to contain the street, sidewalks, utilities, and drainage facilities. Cut and fill requirements may require either additional right-of-way or construction easements. Obtaining construction easements is becoming the more common practice for urban thoroughfare construction.

TYPICAL THOROUGHFARE CROSS SECTIONS

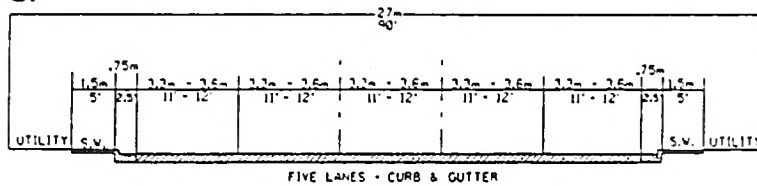
A.



B.



C.



D.

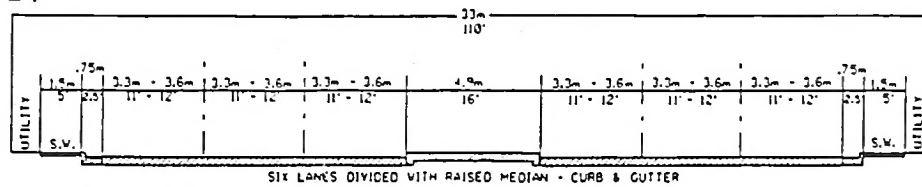
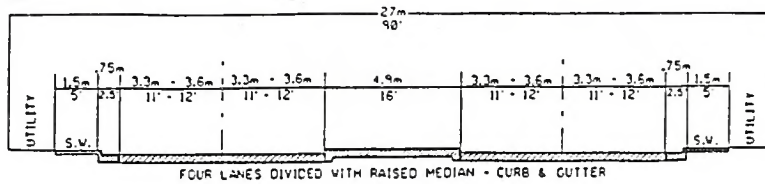


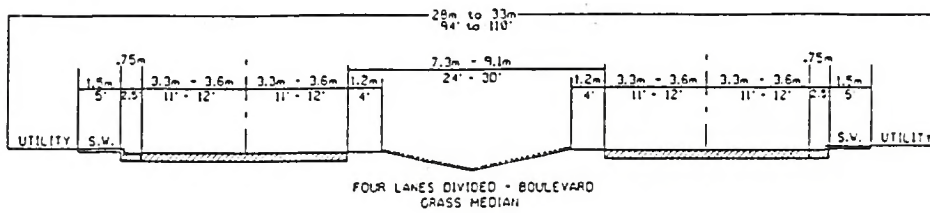
Figure C-1

TYPICAL THOROUGHFARE CROSS SECTIONS

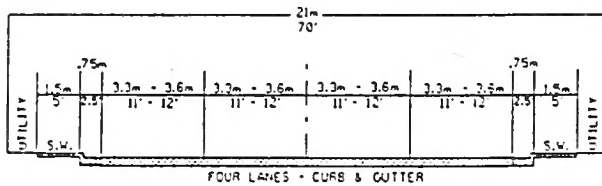
E.



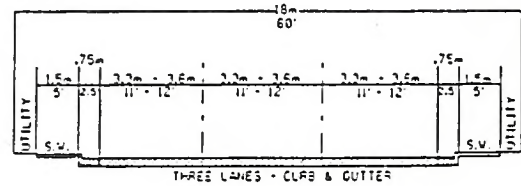
F.



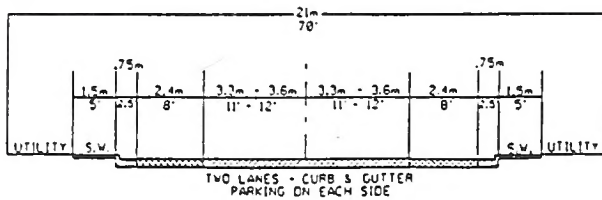
G.



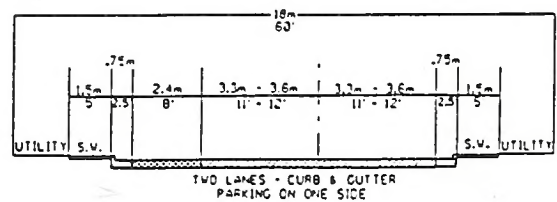
H.



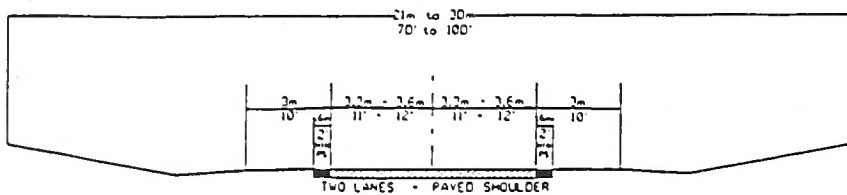
I.



J.

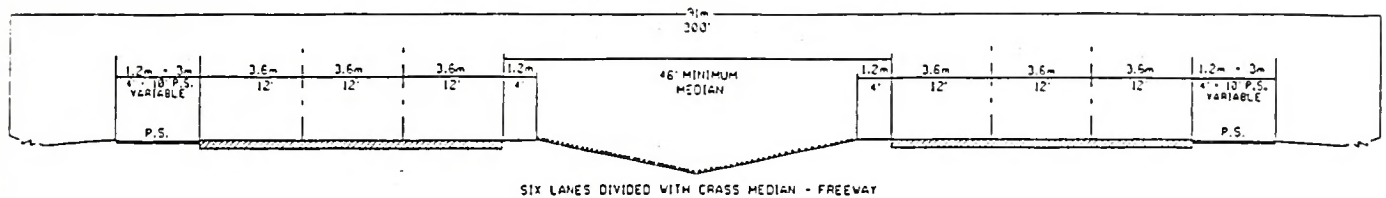


K.

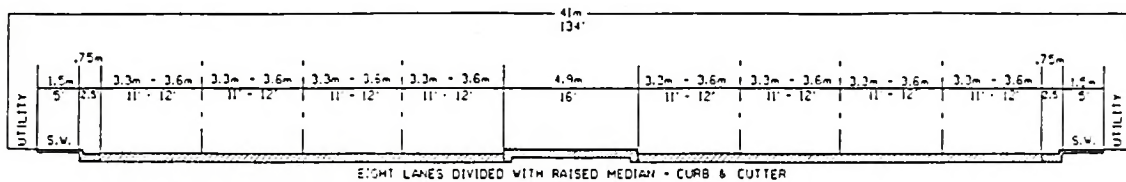


TYPICAL THOROUGHFARE CROSS SECTIONS

L.

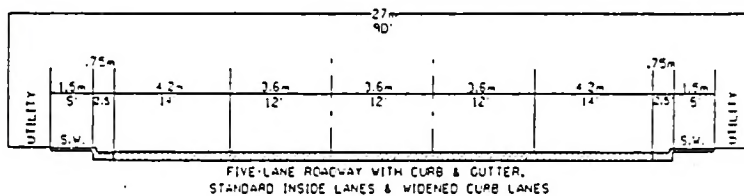


M.

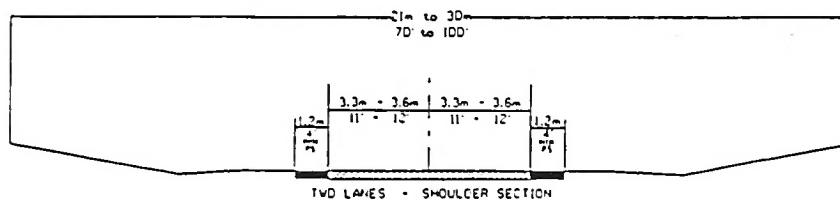


TYPICAL THOROUGHFARE CROSS SECTIONS FOR ACCOMMODATING BICYCLES

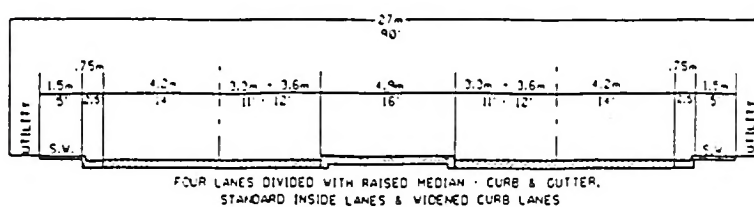
N.



O.



P.



Appendix D

Recommended Subdivision Ordinances¹

Definitions

I. Streets and Roads:

A. Rural Roads

1. Principal Arterial - A rural link in a highway system serving travel, and having characteristics indicative of substantial or interstate travel and existing solely to serve traffic. This network would consist of Interstate routes and other routes designated as principal arterials.
2. Minor Arterial - A rural roadway joining cities and larger towns and providing intrastate and inter-county service at relatively high overall speeds with minimum interference to through movement.
3. Major Collector - A road which serves major intra-county travel corridors and traffic generators and provide access to the arterial system.
4. Minor Collector - a road which provides service to small local communities and traffic generators and provides access to the major collector system.
5. Local Road - A road which serves primarily to provide access to adjacent land, over relatively short distances.

B. Urban Streets

1. Major Thoroughfares - Major thoroughfares consist of interstate, other freeway, expressway, or parkway roads and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.
2. Minor Thoroughfares - Minor thoroughfares perform the function of collecting traffic from local streets and carrying it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating minor through traffic movements and may also serve abutting property.
3. Local Street - A local street is any street not on a higher order urban system and serves primarily to provide direct access to abutting land.

¹The following design standards are in metric units. Conversion factors are included on page D-10 of the Appendix.

C. Specific Type Rural or Urban Streets

1. Freeway, expressway, or parkway - Divided multilane road- ways designed to carry large volumes of traffic at high speeds. A freeway provides for continuous flow of vehicles with no direct access to abutting property and with access to selected crossroads only by way of interchanges. An expressway is a facility with full or partial control of access and generally with grade separations at major inter- sections. A parkway is for non-commercial traffic, with full or partial control of access.
2. Residential Collector Street - A local street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.
3. Local Residential Street - Cul-de-sacs, loop streets less than 750 meters in length, or streets less than one and a half kilometers in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.
4. Cul-de-sac - A short street having only one end open to traffic and the other end being permanently terminated and a vehicular turn-around provided.
5. Frontage Road - A road that is parallel to a partial or full access controlled facility and provides access to adjacent land.
6. Alley - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back side of properties otherwise abutting on a street.

II. Property

- A. Building Setback Line - A line parallel to the street in front of which no structure shall be erected.
- B. Easement - A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.
- C. Lot - A portion of a subdivision, or any other parcel of land, which is intended as a unit for transfer of ownership or for development or both. The word "lot" includes the words "plat" and "parcel".

III. Subdivision

- A. Subdivider - Any person, firm, corporation or official agent thereof, who subdivides or develops any land deemed to be a subdivision.
- B. Subdivision - All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, immediate or future, of sale or building development

and all divisions of land involving the dedication of a new street or change in existing streets; provided, however, that the following shall not be included within this definition nor subject to these regulations: (1) the combination or re-combination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein; (2) the division of land into parcels greater than four hectares where no street right-of-way dedication is involved, (3) the public acquisition, by purchase, of strips of land for the widening or the opening of streets; (4) the division of a tract in single ownership whose entire area is no greater than 0.8 hectares into not more than three lots, where no street right-of-way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.

- C. Dedication - A gift, by the owner, of his property to another party without any consideration being given for the transfer. The dedication is made by written instrument and is completed with an acceptance.
- D. Reservation - Reservation of land does not involve any transfer of property rights. It constitutes an obligation to keep property free from development for a stated period of time.

DESIGN STANDARDS

I. Streets and Roads

The design of all roads within the Planning Area shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway Officials' (AASHTO) manuals.

The provision of street rights-of-way shall conform and meet the recommendations of the Thoroughfare Plan, as adopted by the municipality. The proposed street layout shall be coordinated with the existing street system of the surrounding area. Normally the proposed streets should be the extension of existing streets if possible.

A. Right-of-way Widths - Right-of-way (ROW) widths shall not be less than the following and shall apply except in those cases where ROW requirements have been specifically set out in the Thoroughfare Plan.

1. Rural	Min. ROW
a. Principle Arterial - Freeways	105 meters
- Other	60 meters
b. Minor Arterial	30 meters
c. Major Collector	30 meters
d. Minor Collector	24 meters
e. Local Road	18 meters ¹

2. Urban	Min. ROW
a. Major Thoroughfare other than Freeway and Expressway	27 meters
b. Minor Thoroughfare	21 meters
c. Local Street	18 meters ¹
d. Cul-de-sac	Variable ²

The subdivider will only be required to dedicate a maximum of 30 meters of right-of-way. In cases where over 30 meters of right-of-way is desired, the subdivider will be required only to reserve the amount in excess of 30 meters. On all cases in which right-of-way is sought for a fully controlled access facility, the subdivider will only be required to make a reservation. It is strongly recommended that subdivisions provide access to properties from internal streets, and that direct property access to major thoroughfares, principle and minor arterials, and major collectors be avoided. Direct property access to minor thoroughfares is also undesirable.

A partial width right-of-way, not less than eighteen meters in width, may be dedicated when adjoining undeveloped property that is owned or controlled by the subdivider; provided that the width of a partial dedication be such as to permit the installation of such facilities as may be necessary to serve abutting lots. When the said adjoining property is sub-divided, the remainder of the full required right-of-way shall be dedicated.

B. Street Widths - Widths for street and road classifications other than local shall be as recommended by the Thoroughfare Plan. Width of local roads and streets shall be as follows:

1. *Local Residential*

Curb and Gutter section: 7.8 meters, face to face of curb

Shoulder section: 6 meters to edge of pavement, 1.2 meters for shoulders

2. *Residential Collector*

Curb and Gutter section: 10.2 meters, face to face of curb

Shoulder section: 6 meters to edge of pavement, 1.8 meters for shoulders

C. Geometric Characteristics - The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under Right-of-Way shall apply.

¹ The desirable minimum right-of-way (ROW) is 18 meters. If curb and gutter is provided, 15 meters of ROW is adequate on local residential streets.

² The ROW dimension will depend on radius used for vehicular turn around. Distance from edge of pavement of turn around to ROW should not be less than distance from edge of pavement to ROW on street approaching turn around.

1. Design Speed - The design speed for a roadway should be a minimum of 10 km/h greater than the posted speed limit. The design speeds for subdivision type streets shall be:

Facility Type	Design Speed (km/h)		
	Desirable	Minimum	
		Level	Rolling
Rural			
Minor Collector Roads	100	80	70
Local Roads Including Residential Collectors and Local Residential	80	80	70
Urban			
Major Thoroughfares other than Freeway or Expressway	100	80	80
Minor Thoroughfares	100	80	70
Local Streets	70	70	50

2. Maximum and Minimum Grades

- a. The maximum grades in percent shall be:

Facility Type	Design Speed (km/h)	Maximum Vertical Grade (Percent)		
		Flat	Rolling	Mountainous
Rural				
Minor Collector Roads*	30	7	10	12
	50	7	9	10
	60	7	8	10
	90	6	7	9
	100	5	6	8
	110	4	5	6
Local Roads Including Residential Collectors & Local Residential Streets*	30	--	11	16
	50	7	10	14
	60	7	9	12
	90	6	8	10
	100	5	6	--
Urban				
Major Thoroughfares other than Freeway or Expressway	50	8	9	11
	60	7	8	10
	90	6	7	9
	100	5	6	8

Design Speeds Continued

Minor Thoroughfares ¹	30	9	10	12
	50	9	9	10
	60	9	8	10
	90	7	7	9
	100	6	6	8
	110	5	5	6
Local Streets ¹	30	-	12	17
	50	8	11	15
	60	8	10	13
	90	7	9	11
	100	6	7	-

- b. Minimum grade should not be less than 0.5% .
- c. Grades for 30 meters each way from intersections (measured from edge of pavement) should not exceed 5%.
3. Minimum Sight Distance - In the interest of public safety, no less than the minimum sight distance applicable shall be provided. Vertical curves that connect each change in grade shall be provided and calculated using the following parameters:

Sight Distance

Design Speed (km/h)	30	50	60	90	100
Stopping Sight Distance					
Minimum (meters)	30	60	80	140	160
Desirable Minimum (m)	30	70	90	170	210
Minimum K² Value for:					
Crest Curve	3	10	18	71	105
Sag Curve	4	12	18	40	51

(General practice calls for vertical curves to be multiples of 10 meters. Calculated lengths shall be rounded up in each case.)

¹ For streets and roads with projected annual average daily traffic less than 250 or short grades less than 150 meters long, grades may be 2% steeper than the values in the above table

²K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length in meters of the vertical curve which will provide the desired sight distance. Sight distance provided for stopped vehicles at intersections should be in accordance with "A Policy on Geometric Design of Highways and Streets, 1990".

4. The "Superelevation Table" shown below and continued on the next page shows the minimum radius and the related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter is 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06, with 0.04 being desirable.

Superelevation Table

Design Speed (km/h)	Maximum e	Minimum Radius (meters)
50	0.04	100
60	0.04	150
90	0.04	375
100	0.04	490
50	0.06	90
60	0.06	135
90	0.06	335
100	0.06	435
50	0.08	80
60	0.08	125
90	0.08	305
100	0.08	395

e = rate of roadway superelevation, meter per meter

D. Intersections

1. Streets shall be laid out so as to intersect as nearly as possible at right angles, and no street should intersect any other street at an angle less than sixty-five (65) degrees.
2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.
3. Off-set intersections are to be avoided. Intersections which cannot be aligned should be separated by a minimum length of 60 meters between survey centerlines.

E. Cul-de-sacs

Cul-de-sacs shall not be more than one hundred and fifty (150) meters in length. The distance from the edge of pavement on the vehicular turn around to the right-of-way line should not be less than the distance from the edge of pavement to right-of-way line on the street approaching the turn around. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

F. Alleys

1. Alleys shall be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provisions are made for service access. Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.
2. The width of an alley shall be at least six (6) meters.
3. Dead-end alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turn around facilities at the dead-end as may be required by the Planning Board.

G. Permits For Connection To State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is available at the office of the District Engineer of the Division of Highways.

H. Offsets To Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 9 meters from the edge of pavement. On streets with curb and gutter, utility poles shall be set back a minimum distance of 1.8 meters from the face of curb.

I. Wheel Chair Ramps

All street curbs being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason, shall provide wheelchair ramps for the physically handicapped at intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

J. Horizontal Width on Bridge Deck

1. The clear roadway widths for new and reconstructed bridges serving 2 lane, 2 way traffic should be as follows:
 - a. Shoulder section approach
 - I. Under 800 ADT design year

Minimum 8.4 meters width face to face of parapets, rails, or pavement width plus 3 meters, whichever is greater.

II. 800 - 2000 ADT design year

Minimum 10.2 meters width face to face of parapets, rails, or pavement width plus 3.6 meters, whichever is greater.

III. Over 2000 ADT design year

Minimum width of 12 meters, desirable width of 13.2 meters width face to face of parapets or rails.

b. Curb and gutter approach

I. Under 800 ADT design year

Minimum 7.2 meters face to face of curbs.

II. Over 800 ADT design year

Width of approach pavement measured face to face of curbs.

Where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face of curbs, and in crown drop. The distance from face of curb to face of parapet or rail shall be a minimum of 450 millimeters, or greater if sidewalks are required.

2. The clear roadway widths for new and reconstructed bridges having 4 or more lanes serving undivided two-way traffic should be as follows:

- a. Shoulder section approach - Width of approach pavement plus width of usable shoulders on the approach left and right. (Shoulder width 2.4 m minimum, 3 m desirable.)
- b. Curb and gutter approach - Width of approach pavement measured face to face of curbs.



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English To Metric Conversion Table

<u>English Units</u>		<u>S.I. Units</u>	<u>Abbreviation</u>
1 inch	equals	25.4 millimeters	(mm)
1 foot	equals	0.3 meters	(m)
1 mile	equals	1.6 kilometers	(km)
1 acre	equals	2.47 hectares	(hect)

Metric Equivalents

1 millimeter	equals	0.001 meters
1 kilometer	equals	1000 meters
1 hectare	equals	10,000 square meters

